BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 21. Lancaster, Pa., May 25, 1894. No. 5.

Contributions to American Bryology.—VII.

By Elizabeth G. Britton.

A REVISION OF THE GENUS PHYSCOMITRIUM, WITH DESCRIPTIONS OF FIVE NEW SPECIES.

(Plates 197–203.)

When Sullivant's Mosses of the United States was published in 1856 he recognized three species in this genus, two with European names, one of which has since been referred to *Pyramidula;* the third, *P. immersum*, having gone through the transitional stage of bearing a European name which did not belong to it, by being distributed as *P. sphæricum* in Sullivant's Musci Alleghanienses.

We think as much harm may be done, however, by referring well-known species to old disused names as by adopting European names without comparing specimens, and therefore it has been attempted in this contribution to see the originals in all cases.

The Manual of mosses of North America describes six species. The first, *P. immersum* Sull., is clearly defined and understood. The second, *P. pygmæum* James, has only been collected once, is poorly described, and the only fragments of it preserved in Sullivant's herbarium are a slide and a drawing. The third, *P. pyriforme* (L.) Brid., is a European species, the typical form of which does not occur in America. In a footnote several American varieties are briefly described. The fourth, *P. Hookeri* Hpe., is correctly understood, and the name has the right of priority, but the first synonym given belongs to the last species. The fifth, *P. acumin-*

atum (Schleich.) Br. & Sch., may be said also to be correctly understood, though from the localities cited it is probable that two species are included in the description. The sixth, *P. turbinatum* Müller, is a duplication of names not intended by Müller, and should replace *P. pyriforme* for the American forms of this variable species.

Since the publication of the Manual, three other species have been described from Macoun's collections by Kindberg, *P. megalocarpum*, *P. strangulatum*, and *P. platyphyllum*. The first will stand for the large Western forms of what we have been calling *P. pyriforme*, the second is a synonym of *P. turbinatum*, and the third is described from such very immature specimens that it will also probably not stand, though Prof. Macoun and Mr. Fletcher owe it to students to follow this species up, and collect, if possible, more and better specimens.

Five other well-defined species are described and figured in this contribution, and more specimens from the West and South are desired.

PHYSCOMITRIUM IMMERSUM Sull. in A. Gray, Man. Ed. 2, 651 (1856); Icones, 93, *t. 56* (1864).

P. sphæricum var? Sull. Musci. Alleghen. No. 196. (1848).

This species is the only one of the genus which matures its capsules in the fall, and is liable to be mistaken for *Aphanorhegma serrata*, which it closely resembles. The Manual says it "differs merely in the inflorescence, the dehiscence of the lid, and the leaves more distinctly serrate by yellowish cells." The splitting of the capsule exactly in the middle and the thickening of the angles of its cells sufficiently distinguish *Aphanorhegma*, whereas the annulus and border of 2–3 rows of denser transversely elongated cells of the capsule in *P. immersum* shows its alliance with the genus to which it has been referred.

Type locality: "River banks, Southern Ohio, Lea." It has also been collected in Western Pennsylvania, by Lesquereux; on the banks of the Allegheny river, by D. A. Burnett; of the Susquehanna, by J. K. Small; along the Delaware at Camden and Philadelphia, by T. P. James and C. F. Austin; along tidal ditch banks at Wilmington, Delaware, by A. Commons; at Albany, New York, by C. H. Peck; on sandy clay bank of the Mississippi river, at Winona, Minn., by J. M. Holzinger; in a dry slough

in Saline county, Missouri, by C. H. Demetrio; Colorado, Wolf & Rothrock, 1873; South Carolina, Ravenel; on inundated alluvial soil (in small tufts) along the outlet of Leamy's Lake, near Hull, Quebec, October 4, 1889, Macoun.

Exsiccatæ: Sull. Musci. All., No. 196; S. & L., Musci Bor. Am. Ed. II., No. 233; Austin Musci App., No. 179.

PHYSCOMITRIUM PYGMÆUM James, Bot. King's Exp. 404 (1871). L. & J. Manual, 197 (1884.)

(Plate 197, from original drawings by Sullivant.)

Plants small, 3–5 mm. high; stems leafy, simple or sparingly branched; leaves longest at apex, oblong acuminate, serrulate, vein ending in or below the apex; seta short, almost immersed, twisted to the left, as long as the oblong-pyriform capsule; annulus of two rows of narrow cells, persistent; mouth bordered by 5–7 rows of oblong cells; neck tapering with few stomata; lid large, conic apiculate; calyptra lobed and beaked, spores rough, .028–.031 mm., maturing?

Utah, Watson, 1869; not collected since. Only fragments are preserved in Sullivant's herbarium.

Type locality: "On the ground above Parley's Park, in the Wahsatch mountains, Utah, at 6,500 feet altitude, Watson; a few imperfect specimens."

The description given of this species in the Manual is misleading, as the plants are compared with both *P. immersum* and *P. Hookeri*, and it is not stated whether the capsules are immersed or exserted. The printer has also increased the confusion by transposing the phrase "marginal cells transversely oblong, in 5–7 rows," to apply to the leaves, whereas it refers to the mouth of the capsule.

The following description was sent to us by Dr. B. L. Robinson from Sullivant's herbarium, with the original drawing made by Sullivant, which we have been permitted to copy and reproduce:

"109. PHYSCOMITRIUM PYGMÆUM, Sp. Nov.

"Plantæ generis minima, a *Physcomitio pyriformi* distat exiquitate foliis minus distincte serratis; capsula oblonga-pyriforme cellulis marginalibus transverse oblongis in seriebus 5–7 (nec 12–15) dispositis instructa basi paucius stomatifera; operculo longiore; pedicello toto sinistrorsam torto," etc.

"The shape of the capsule with its adherent annulus readily distinguishes this species from *Physcomitrium hians*, Lindb."

PHYSCOMITRIUM PYRIFORME (L.) Brid. Bryol. Univ. 2 : 815 (1827).
Bryum pyriforme L. Sp. Pl. 1580 (1753).

Gymnostomum Physcomitrium pyriforme Brid. Bryol. Univ. 1 : 98 (1826); also of all subsequent European authors, not American.

We have in the Jaeger and Torrey herbarium specimens of this species from all parts of Europe. The first and most striking difference observed between European and American specimens is the uniform length of the pedicels in the former and the regular, more pyriform capsules, which are larger than the American specimens and dry more uniformly in shape and color; the lid also is flat, the beak longer and more sharply apiculate when dry; the neck is shorter and less contracted below the spore-sac when dry, and the capsules are none of them as conspicuously constricted below the mouth as in our specimens. Even from macroscopic differences the species seem to be distinct, but when we examine the mouth of the capsules we find that the annulus is more highly differentiated in European specimens, being double, and falling in fragments with the lid, while in American specimens it is single and persistent, composed of a narrow row of orange-colored cells with the second row of hyaline vesicular cells bent in after the falling of the lid. The walls of the capsules, too, are different; in European specimens the cells are lax and indistinct, in American they are regular and very clearly outlined by their thick cell walls. Those around the mouth are seldom more than 12 rows, usually 8–12, whereas Limpricht says of the European, 8–16.

PHYSCOMITRIUM TURBINATUM (Michx.) Brid. Bryol. Univ. 2: 815 (1827).

Gymnostomum turbinatum Michx. Fl. Bor. Am. 2: 286 (1803).
Gymnostomum dilatatum Beauv. Prod. 59 (1805).
Gymnostomum splachnoideum Beauv. Prod. 59 (1805).
Gym. Physcomitrium tortipes Brid. Bryol. Univ. 1: 100 (1826).
Physcomitrium turbinatum Mueller; L. & J. Man., 198 (1884).
Physcomitrium pyriforme, not Brid. of American authors.

On consulting the original descriptions of the above references it will be seen that in all cases but the last they were based on American specimens by European authors and indicate a difference in comparison with the European *P. pyriforme*. They

also indicate the variability of the American species, though the variations are not constant enough to be specific, and hardly sufficient for varietal rank. For the sake of the argument the original descriptions are quoted:

Gymnostomum turbinatum Michx.

"G. brevicaule simplex: foliis lanceolatis, apiculatis, serrulatis sporangio oblongiuscule turbinato; operculo convexo, submamillato.

"Habitus et magnitudo *G. pyriformis;* pedunculo longiore; sporangio excusso operculo magis truncato minusque crasso.

"Hab. in Carolina inferiore."

"*Gym. dilatatum* Beauv. Caule simplici erecto foliis spathulatis apici serrulatis, pyxidis pyriformis orificio magno, patulo."

"Amerique Septentrionale."

"J. 'ai rapporte cette espece des Etats-Unis d'Amerique (Caroline du Sud), elle est remarquable par l'orifice large et trés-ouvert de l'urne; du reste elle a le porte du *Gym. pyriforme.* Elle croit dans les lieux inondés."

"*Gym. splachnoideum* Beauv. caule simplici erecto; foliis ovato lanceolatis, serrato-dentatis, acuminatis, costa integra notatis, pyxidibus oblongis." Amerique septentrionale.

"Je l'ai trouvée dans le nouveau Jersey: elle differe du *Gym. pyriforme* par la forme de l'urne, qui est comme ètranglée au milieu."

"*Gymnostomum Physcomitrium tortipes* (Bernh. Brid.) caule erecto simplici, foliis ovato-lanceolatis concavis strictis subpatentibus, pedunculo gracili flexuosissimo, thecæ turbinatæ superne coarctatæ operculo umbonata."

In America septentrionali circa Philadelphiam habitat. Clar. Bernhardi communicavit.

"Specie, ut videtur, distinctum a *G. turbinato,* quod thecæ forma æmulatur, pedunculo nullatenus crasso stricto, sed valde flexuoso, præsertim in statu sicco ita ut theca nutet, unciale, longiore. A *splachnoideo* autem differt theca non in medio sed apice coarctata, ut et pedunculis duplo longioribus, gracilioribus, contortis; ab utroque tandem foliis strictis, aqua sese pulchre explicantibus. Rete vasculosum etiam diversum.

Through the kindness of M. Bescherelle and M. Franchet, I have been permitted to examine Michaux's types of *Gymnostomum turbinatum.* Three specimens were sent to me from Richard's herbarium in the Musée d' Histoire Naturelle at the Jardin des Plantes. They were collected by Michaux, and are undoubtedly

the specimens from which the description was drawn. They represent different specimens from different habitats, as they are not all in the same stage of development, but they show the same variations that other North American specimens do. Several of the plants are larger than the average, 15–25mm. high, the stems short and simple or branching, several are 15mm. high with more than one capsule on a plant. They are particularly noticeable for the different lengths of the pedicels, for the turbinate capsules, and the blunt lids, all of which points Richard recognized as different from the European species.

I have not seen the types of the two species described by Beauvois, but from the descriptions I do not think there is any doubt that they all refer to one very variable species.

Dr. Torrey corresponded with and sent specimens to Bridel, and I find in his herbarium four specimens numbered and named presumably by Bridel, as follows:

11. *Gymnostomum pyriforme*, without locality, presumably American.

29–30. *Gymnostomum turbinatum*, collected by Schweinitz.

31. *Gymnostomum splachnoideum*, from Canada.

They are all referable to *P. turbinatum*. It will be remembered that as late as 1826 Bridel, in the Bryologia Universalis, maintained three American species as distinct from *P. pyriforme*.

Physcomitrium turbinatum Müller, ined. L. & J. Man. 198 (1884).

G. turbinatum Michx. is given as a synonym of *P. Hookeri* in the Manual, but this is evidently a mistake. Lower down on the same page *P. turbinatum* Müller, ined., is described as a species, thus duplicating a specific name in one genus, and confusing the synonymy. In order to settle the doubts raised by this mixture, I wrote to Paris, and M. Bescherelle sent me a portion of Boll's Texan specimens from the herbarium of C. Müller, these being the ones from which the description of *P. turbinatum* in the Manual was drawn. In his reply, dated May 1, 1893, Bescherelle says: "Quant au *Physc. turbinatum* du Texas (Boll legit) attribué par Lesquereux et James a C. Müller, je ferais remarque que Müller me l' a envoye sans nom d' auteur, dans la pensee que je n' ignorais pas que cette espece etait celle de Bridel, Michaux,

Richard, autrement il n' aurais negligé de mettre son nom a la suite du nom specifique, comme il le fait toujours."

I had already suspected that this might be the case, and had written to Müller asking him whether he intended to make a new species or refer Boll's specimens to *G. turbinatum* Michx. He returned my letter annotated, and in reply to the above question says, "Ad hancce speciem" (to this very species). T. Boll's specimens collected in Dallas County, Texas, are represented in our herbarium by three packets, one received from M. E. Bescherelle, ex herb. Müller, and two from the Jaeger herbarium. One of these is an autograph specimen from Müller labeled "*Physcomitrium pyriforme* var. *turbinatum*," and the other was found in a package of unnamed mosses collected by Boll, sent by Müller to Dr. Jaeger. The plants all agree, as the Manual says, in being "cæspitose" and "much divided," some of the stems are 25 mm. long, and branch three times. The leaves are distinctly acuminate, but the vein is not excurrent, and the margins are distinctly serrate above the middle, not "entire at apex." In my letter to C. Müller I asked about this point, and he says "apice grosse serrata." In the footnote in the Manual the leaves are said to be entire at the apex or nearly so, which seems a strange mistake to make, as they had authentic specimens; the capsule, too, is said to be without a "collum," but Müller says, "Non sed collum apophysatum adest." Our specimens show the neck wrinkled and contracted below the spore-sac when dry, and stomatose. The capsules are rather large, nearly 2 mm. long, lid flat and blunt, seta 10–15 mm. long, the mouth bordered by twelve rows of transversely elongated cells, and quite flaring when dry. The longest leaves are 4 mm. long, and the resemblance of the plants to the lax forms distributed by Sull. & Lesq. Musci Bor. Am. Ed. II. No. 234, as *P. pyriforme* is very close. They evidently grew in a damp muddy place. Similar specimens were collected by L. M. Underwood at Orange Bend, Fla., by Parker at Camden, N. J., and at Fort Edward, N. Y., by E. C. Howe. We have specimens from the vicinity of New York City, grown in wet places, which are much taller and more lax than the form from dry fields.

Kindberg has been struggling with the same difficulty in

studying Macoun's mosses, and has also succeeded in making another synonym, which is very suggestive of the most conspicuous characteristic of our North American species. In the Ottawa Naturalist (**4**: 62, 1889) he described *P. strangulatum* Kindb., which later, in Macoun's Catalogue (Part **6**: 103, 1892) is referred to *P. turbinatum* C. M. (L. & J. Man. 198). The specimens from both localities cited in the catalogue have been sent to me by Prof. Macoun, mixed together in one packet, so that I cannot tell from which locality the large lax ones, which match Boll's Texan specimens, were collected, but they are correctly referred to "*P. turbinatum* Müller," probably by Müller himself, who has recently been verifying some of Kindberg's determinations.

P. platyphyllum Kindb. Macoun's Cat., Part 6, 269 (1892).

We have tried to get good specimens of this species, but neither Prof. Macoun nor Mr. Fletcher have any but immature specimens, and from the description it seems evident that the types also were "unripe." Prof. Macoun kindly sent us all he had, and we have compared them with all the immature specimens of *P. turbinatum* in our collection and have been forced to the conclusion that this must also rank among the synonyms of that species.

We have no desire to suppress or supplant any well-established new species, but cannot adopt a name, and refer other specimens to it, when it is impossible to say that we are sure we should recognize it again. These specimens of *P. platyphyllum* have no character. They are too young to show the mature shape of the capsule, or the lid, or the size of the spores, and deserve to be relegated to the limbo of uncertainty, but as so few specimens of *P. turbinatum* have been collected in Canada it may incite others to gather specimens whenever they see them, hence the following amended description is given:

Physcomitrium platyphyllum Kindb.; Macoun's Cat. Part 6, 269 (1892).

Plants gregarious, stems simple or branched at base; leaves sublingulate, 2–3 mm. long, serrate above the middle, upper very broad ovate-acuminate, indistinctly margined; vein percurrent or ending below the apex; cells wide subhexagonal, the basal subrectangular. Seta 5–10 mm. long, stout, pale yellow, bent; capsule too immature to see the ultimate shape; lid conic, blunt; cal-

yptra 7–8 lobed; mouth bordered by 8–10 rows of cells, annulus orange-colored, with a vesicular row bent inward; spores immature.

On earth in the streets of Ottawa, Ontario, Fletcher. Differs from *P. turbinatum* in the broader leaves? Macoun's number 597 Canadian mosses was distributed as *P. pyriforme*, from two localities, Windsor and Sandwich, Ontario, May 24, 1892. It contains two species, growing together, *P. turbinatum*, a small slender form, scarcely mature, and *P. Drummondii*, a few large, ripe capsules, with much thicker pedicels, and dark brown in color.

If we turn to Renauld and Cardot Musci Americæ Septentrionalis, p. 31, we shall find that we have another tangle of new names and old ones to deal with. Thanks to the generosity of M. Cardot, I have been favored with authentic specimens of all his types of this genus and have been able to make some very interesting comparisons and corrections. Their check-list enumerates *P. pyriforme*, Brid., as an American species, and after calling his attention to my views, M. Cardot still maintains that it is, and sends me a portion of his set, S. & L. Musci bor. Am., Ed. II., No. 234, as an example. I have compared his and ours with European specimens and am still forced to differ from him, for reasons already stated.

Three varieties are listed:

"Var. *tortipes* (Brid.) Sine loco." The specimens referred to in the Manual under this name are Drummond's No. 25 from Apalachicola, Fla., though this is probably not the form so named by Bridel, whose specimens came from Pennsylvania.

"Var. *floridanum*, R. & C. A forma typica foliis longioribus longius acuminatis, magis serratis capsulaque ore valde dilatato, vacua cupuliforma, diversa."

We presume he means by "forma typica" the European species. In a letter received October 18, 1893, he sends me this variety as equal to *P. turbinatum*, admitting my conclusion as far as these specimens are concerned and dropping this varietal name.

"Var. *Langloisii*, R. & C. Bot. Gaz. 94, 1889, N. J., La."

We have examined the specimens collected by Langlois and authenticated specimens from Cardot. They are unlike any Northern specimens in their long, slender pedicels, narrow, tur-

binate, almost campanulate capsules, and pale yellow color. We have it from several other Southern localities and collectors, and it maintains its individuality. We also have the specimens collected at Atco, New Jersey, by H. A. Green, which have also been referred by the authors to this variety, and some specimens collected in the vicinity of New York from wet localities, were so named by M. Cardot. We regret that he should not have maintained this varietal name for the lax, pale, slender, Southern form, from which it was originally named, and not extended it to include all our taller Northern ones, which are not at all constant, and are dependent on exposure, soil and moisture.

We are inclined to think that var. *Langloisii* is almost worthy of specific rank, and have figured it in order to call attention to it, and obtain more material.

P. Hookeri var. *serratum*, R. & C. "A forma typica foliis dimidio superiore grosse et obtuse serratis distincta."

We have received from both Cardot and Henderson duplicates of the specimens on which the above variety was based. We cannot find the well differentiated annulus so characteristic of *P. Hookeri*, and have since discovered that they are identical with the specimens we sent to M. Cardot under two manuscript names from two localities; the first collected by Langlois in Louisiana, was named for that state, and the second collected by Jermy in Texas was named for that state. Further comparison and study have convinced me that all three are identical with the specimens collected by Drummond near New Orleans and distributed in 1848 as *P. pyriforme*, var. 3, No 24, of his Southern mosses. We have named it PHYSCOMITRIUM DRUMMONDII, after the original collector, and rejected both our own manuscript names, as the species is found to have a much wider range than we at first supposed.

We wrote to M. Cardot, giving him our views on the differences between the European *P. pyriforme* and the American *P. turbinatum*, and at the same time calling his attention to the fact that his var. *serratum* could not be referred to *P. Hookeri*, on account of its simple annulus. He admitted the correction, and transferred it to the American species, as *P. turbinatum*, var. *crassipes*, m. s. This name has not been published, though we have given him abundant time to do so, as it is over six months since our

correspondence on this subject. We would have adopted his name, which is very appropriate, in reference to the thick pedicel, if M. Cardot had taken the trouble to compare all the specimens as I have done, and had then recognized its claim to specific rank, but we question his right to coin another varietal name for one already printed, even though the first name, *serratum*, was less suitable under the new species to which he referred it than under the old, and we also disagree with the second specific determination, as the capsules have only 5–7 rows of cells around the mouth; the lid is apiculate, and the spores are larger than in the species to which he has referred it. We cannot use his original name, *serratum*, for the name of the species, because it has already been used in the genus as one of the synonyms of *Aphanorhegma serrata* by C. Müller.

Both of our own manuscript names, which we have rejected, have priority over his varietal one, and he had authentic specimens of both from us at the time that he might have compared with his.

Physcomitrium turbinatum (Michx.) Brid.

Plate (198.)

The following description is drawn from American specimens only:

Plants light green, gregarious, 8–20 mm. high; autoicious-antheridia terminal on lateral or basal branches; stems short and simple or taller and branching, 3–10 mm. high; leaves 3–5 mm. long, oblanceolate or obovate from an oblong base, serrate above the middle; vein ending below the apex or occasionally excurrent into an acuminate apex; lower cells oblong, upper rhomboidal or hexagonal, the marginal longer and narrower, often yellow and inflated at their upper ends; seta 5–15 mm. long, erect or twisted and occasionally arcuate; capsule erect, 1–2 mm. long globose-pyriform when fresh, becoming turbinate, and contracted below the mouth and spore-sac when dry, dark brown and often urceolate when empty; lid convex or mamillate, occasionally apiculate when dry, blunt; mouth bordered by 8–12 rows of cells and a narrow row of orange-colored cells, with a hyaline vesicular annulus, which is persistent and incurved after the falling of the lid; calyptra cucullate, oblique and split unequally, 5–8 lobed and beaked; spores rough, .027–035 mm., maturing in spring.

A common but variable species in old fields, grassy open places in gardens, etc., from Florida to Ontario, west to the Rocky

Mountains and California(?). Type locality in South Carolina. Founded on lax specimens.

Var. LANGLOISII (R. & C.) E. G. Britton.

(Plate 198.)

P. pyriforme var. *Langloisii* P. & C., Bot. Gaz. **14**: 94 (1889).

Plants pale yellow; stems usually short and simple, slender; occasionally tall and branching to 2 cm.; leaves narrow, acuminate, often 5 mm. long; seta filiform, 10–20 mm. long; capsule small, 1 mm. long, almost campanulate, not contracted below the mouth when dry, neck tapering, often contracted below the spore-sac. Spores maturing in January and February, .027–.035, spinose.

In low swampy ground and in gardens, probably only in the Southern States. Type locality, in Louisiana, Langlois, also collected by Joor and Featherman; Texas, Hockey; Florida, Chapman and J. D. Smith.

PHYSCOMITRIUM MEGALOCARPUM, Kindb. Bull. Torr. Bot. Club, **16**: 94 (1889).

Plants the largest of the genus often 3–4 cm. high, light yellow or brown when old; stems short, simple only 3-5 mm. high; leaves spreading flat and open when dry, not much twisted or shrivelled, 5–7 mm. long, 1.5–2 mm. broad, lanceolate from a lax oblong base; lower cells large, inflated at angles, marginal longer and narrower in two rows, yellow, entire or serrulate; vein ending in the acute or acuminate apex; vaginule 1–2mm. long; seta 15–25 mm. long, erect or twisted and bent; capsule large, globose-pyriform, nearly as broad as long, 2–3 mm., usually urceolate when dry contracted at neck and below the mouth when dry; lid conic, bluntly apiculate, mouth small, not flaring, bordered by a narrow orange-colored annulus with a second hyaline row and 8–12 rows of denser, but slightly elongated cells; neck short, stomatose; spores rusty brown, spinose, .027–.035mm., ripe from April to June.

Type locality Victoria, Vancouver Island, Macoun, Canadian Mosses No. 147, also collected by Bolander in California; Watson, Nevada; Henderson, Oregon and Piper in Washington.

Differs from *P. turbinatum* in its greater size, larger, more urceolate capsule, with a longer seta, and in the less inflated cells of

the margins of the leaves. The cells bordering the mouth are smaller, which gives it a more pyriform urceolate shape when dry.

PHYSCOMITRIUM AUSTRALE n. sp.

(Plate 199.)

Gymnostomum tortipes Hook.: in Drummonds' Southern Mosses No. 25 (1848), non Brid. Bryol. Univ. 1: 100 (1826).

Autoicous, the antheridia terminal and cotemporaneous with the fruiting axis. Plants gregarious, tall slender, 3–4 cm. high; stems 25mm. tall, branching repeatedly and rooting at the joints; lower leaves short distant, with the vein ending below the apex, upper 3–4mm. long, 8–10 crowded around the base of the seta, all narrow oblong-lanceolate, serrate above the middle, marginal cells narrower and longer, teeth small appressed; vein ending below the acute apex; seta short, 5mm., pale, twisted and curved; capsules often cernuous, subglobose, becoming turbinate, and flaring at mouth when dry and empty, small, 1–1.5 mm. long, often broader than long, neck tapering, contracted stomatose; lid flat and apiculate when dry, conic when moist, bordered with brown; mouth bordered by 5–8 rows of large, clear cells and a darker annulus, with a second row of hyaline cells incurved and almost invisible, cells of the walls irregular with thick walls; spores rough, warty brown, .037–.043mm., maturing in spring.

Type locality Apalachicola, Florida, Drummond's No. 25, 1848. Not since collected, though specimens gathered by Dr. Garber in Southern Florida in 1878, and distributed as No. 268, resemble this species in the tall, leafy stems, but the pedicels are much longer, not curved, and the mouth is bordered by 8–12 rows of cells, and the spores are smaller. They are probably referable to *P. turbinatum* var. *Langloisii*, and show connecting characters.

The var. *Langloisii* seems to bear the same relation to *P. turbinatum* as var. *calvescens* does to *Funaria hygrometrica*, and *P. australis* corresponds to *var. patulum*. In both cases they are Southern in range, and are propably due to extreme heat and moisture in early spring. They both fruit earlier than the species at the North, and are taller, more slender and yellowish green.

PHYSCOMITRIUM HOOKERI Hampe, Icon. Musc. 3: *t. 30* (1844).

Gymnostomum latifolium Hook. in Drummond's Musci Am. No. 16 (1828), non Brid.

Gymnostomum latifolium Schwaegr. Suppl. iv. *t. 304* (1842).

Physcomitrium latifolium Lindb. Ofv. Akad. 21: 595 (1864).

Physcomitrium hians Lindb. Manip. Musc. 1: 51 (1870).

P. hians Sull. Icon. Musc. Suppl. 26, *t. 16* (1874.)

The first synonym given in L. & J. Manual has already been shown to belong to another species.

Drummond's No. 16 was issued in 1828 by Hooker and Wilson, with the following description:

"*Gymnostomum latifolium* n. sp. acaule, foliis paucis rotundatis acutis imbricatis reticulatis, seta breviuscula, capsula turbinata, operculo plano rostellato, calyptra mitriformi, quadrisixfida."

"Low points of the Saskatchewan, near Carleton House."

Sullivant followed Lindberg in calling it *P. hians*, and says in the Icones: "The reason for displacing this species to constitute of it a mere variety of Drummond's species is not evident. As has already been remarked by Wilson, in the London Journal of Botany (vol. 3, 433, 1841), it is very variable in size, some of the plants being as long as those of *P. pyriforme*, with which it is generally found mixed. Indeed, it apparently may be found passing into that species through intermediate forms."

In Sullivant's herbarium is preserved a portion of the type of *P. hians* Lindb., founded on part of Sullivant's specimens of No. 234, S. & L. Musci Bot. Am. Ed. II., and these were compared with Drummond's No. 16. They are all one species, so that we do not understand the meaning of the above remarks, especially as this species has the most highly developed annulus of the genus, and characteristic leaves. Unfortunately Hooker's very descriptive name, *latifolium*, was pre-occupied by Bridel for a Corsican species (Brid. Bryol. Univ. 1. 760, 1826).

Hampe's name occurs incidentally under the description of *P. Thieleanum*, but he gives *G. latifolium* Hook. as a synonym, and cites Schwægr. Suppl. t. 304, so that this name, and not the one Sullivant figured it under in the Icones, will have to stand.

Type locality: "Low points of the Saskatchewan, near Carlton House, Drummond." It has also been collected in Manitoba and Ontario, by Macoun, Canadian mosses No. 146; Montana, R. S. Williams; South Dakota, T. A. Williams; Minnesota, Lapham and Holzinger; Kansas, W. A. Kellerman and Minnie Reed, and Ohio, Sullivant, by whom it was issued, mixed with No. 234, S. & L. Musci bor. Am. as *P. pyriforme*.

PHYSCOMITRIUM ACUMINATUM (Schleich.) Br. & Sch. Bryol. Eu. *t. 300* (1841).

Gymnostomum acuminatum Schleich. Cat. Pl. Helv. 4: 40 (1821).

The description is drawn entirely from American specimens:

Autoicous, the antherida terminal on basal branches. Plants gregarious, pale green, slender, 10–15 mm. high; stems short, 2–3 mm., leaves almost radical, rosulate, 2–3 mm. long, oblong-lanceolate, acuminate, vein thick, ending below the apex or excurrent into a cuspidate point; marginal cells elongated in two rows, entire or subserrulate at apex, lower cells elongated, often brown at angles; seta pale, slender, twisted, 10–13 mm. long, often bent; capsules small, 1 mm. long, pyriform, becoming turbinate when dry, with a broad flaring mouth, not contracted below it; neck tapering, often abruptly contracted when dry; mouth bordered by 4–7 rows of narrow cells, but slightly elongated or thickened, those of the walls smaller than in *P. turbinatum* and rounded; annulus double, outer row orange colored, inner hyaline, vesicular, falling in fragments with the lid or persistent; lid blunt, conic or apiculate, bordered with orange; calyptra small 2 mm. long, lobed; spores small, .014–.021 mm., spinose, yellow, ripe in May and June.

Type locality in Switzerland. An uncommon species not yet reported east of the Alleghanies, ranging through the Central States both east and west of the Mississippi. Collected by H. J. Webber at Nebraska City, Nebraska, June 1, 1889; Argentine, Miss Reed, April and May, 1891; Cloud Co., W. A. Carlton; also Phillips Co., Kansas, Hatcher and Farm Ridge, La Salle Co., Illinois, J. W. Huett. Also by E. Hall in Illinois, according to the Manual.

Through the kindness of M. H. Philibert we have received a specimen supposed to be this species, collected by Gander near Lienz, in the Tyrol, in July, 1878. This is one of the specimens cited by Limpricht in his Laubmoose, but does not agree exactly with the description given by him, as the cells around the mouth, instead of being in 11–15 rows, seem to be only six. We have also recently received from Dr. H. Solereder a duplicate specimen from the herbarium of the University at Munich, collected by Wienkamp near Wasam, in May, 1865. They also have only 7–8 rows of cells around the mouth, and a narrow yellow annulus; the lid is short and blunt or truncate. The spores measure .024–.027mm., and are rough but not spinose.

This rare species has only been distributed once in European exsiccatæ and never in American ones, so that we have not much material to guide us. Neither have we been able to see the speci-

mens cited in Lesquereux and James' Manual for this species, for they cannot be found in either Sullivant's or James' herbarium.

The description in the Manual does not fit the American specimens altogether, and we suspect from the localities that they may have confused our *P. Drummondii* with this species. The spores are described as "large." Limpricht cites them as .026–.032 mm., or a little smaller than in *P. pyriforme* and *P. turbinatum*. It will be seen that the spores in our specimens are much smaller.

The following remarks are copied from the Bryologia Europæa, and refer to *P. acuminatum* (*t. 300*):

"Cette espéce que nous avons reçue de Schleicher, se distingue du *P. pyriforme* par sa grandeur moindre, par ses feuilles plus longuement acuminées ordinairement a bords entiers ou a peine denticulés, par la nervure mediane de la feuille qui est excurrente ou qui ne cesse qu'avec le sommet du limbe foliare, par l' embouchure plus large de la capsule sèche et enfin par les sporules presque de moitié plus grandes."

Physcomitrium Kellermani n. sp.

(Plate 200.)

Autoicous, the antheridia terminal in basal buds. Plants scattered or gregarious, dark brown when mature, small, seldom more than 3–5 mm. high; stems simple, with basal innovations; leaves few, rosulate, 1–3 mm. long, ovate acuminate; vein excurrent into the subulate apex or ending below it; margins coarsely serrate; cells inflated, basal cells lax, scarcely elongated; seta short, 1–2 mm. long, scarcely exceeding the perichætial leaves, occasionally 3 mm. long and exserted; capsule short pyriform or globose when empty, contracted below the mouth or broadly flaring, bright brown when old, 1–1.5 mm. long, neck short, tapering or swollen into an hypophysis, stomatose, rugose; mouth bordered by 4–7 rows of cells, and a narrow persistent annulus of darker cells with a hyaline incurved row almost invisible; lid small, conic-rostrate; calyptra large, 2–2.5 mm. long, 3-lobed; spores large, .045–.048 mm., rough, warty, but not spinose, maturing in March and April.

Type locality, Manhattan, Kansas, Kellerman (1889); also collected by J. B. Hatcher at Long Island, Phillips Co., Kansas (1885) (ex herb. E. A. Rau), by Miss Reed at Argentine, Kansas; and by H. J. Webber at Nebraska City, Nebraska(1889).

Differs from *P. Hookeri*, for which it is liable to be mistaken, by its smaller size, flaring mouth and single annulus; from *P. turbinatum* also in the smaller size and narrow-bordered mouth; from both in its larger spores.

PHYSCOMITRIUM DRUMMONDII, n. sp.

(Plate 201.)

Physcomitrium acuminatum L. and J. Man. 198 (1884) in part?

P. Hookeri var. *serratum* Ren. & Cardot, Rev. Bryol. 19: 93 (1892).

Plants gregarious or scattered, 3–10 mm. high; stems with short basal branches; leaves narrow, strictly erect, lanceolate-acuminate, 2–3 mm. long, serrate above the middle, marginal cells longer and broader, inflated or yellow, basal cells lax; vein thick, ending below the apex or excurrent into a cuspidate point; seta stout, straw-colored or brown when old, short, only 3–5 mm. long, erect slightly twisted; capsules 1 mm. long, pyriform turbinate, not contracted below the flaring mouth when dry, bordered by 6–8 rows of narrow elongated, thick brown cells, very distinct from the cells, with sinuous walls of the rest of the capsule; annulus narrow, orange-colored, persistent, with a second incurved hyaline row; lid conic-rostrate, bordered by orange, beak as long as the spore-sac, which is shallow and broad; neck contracted below the spore-sac, stomatose; calyptra large, 2–3 mm. long; spores large, .040–.045 mm., warty, maturing April.

Type specimens collected by Drummond near New Orleans, and distributed as No. 24 of his Southern mosses in 1848 as *P. pyriforme*, var. 3. Also collected by A. B. Langlois, at Pointe a la Hache "on ground along roadsides 1886," and distributed as No. 44 of Ren & Cardot's, Musci Am. Sept. Exsic. Recently collected by B. F. Bush, at Campbell, Missouri, and ranging northward into Canada, Belleville, Macoun, west to Oregon, Henderson. The specimens sent to me from the Department of Agriculture, collected by Jermy in Texas, and referred to *P. acuminatum*, with some doubt, are also this species, differing from *P. acuminatum* in its smaller size, strict, erect habit, stout seta, narrow bordered mouth, rostrate lid and larger spores, which are warty not spinose, and double the size of any American specimens of *P. acuminatum*, which I have seen. We suspect Wright's Texan specimens cited in the Manual also belong here, though we have not seen them, but the spores are described as "large." Hall's Illinois specimens are probably *P. acuminatum*.

PHYSCOMITRIUM COLORADENSE n. sp.

(Plate 202.)

Autoicous, the antheridia in basal buds, few, large, without paraphyses. Plants small, 3–4 mm. high, scattered or gregarious; stems short, simple or with basal buds; leaves few, radical, erect, concave, 1.5–2 mm. long, base short, auriculate, cells lax, upper cells shorter, marginal serrate or inflated above the middle, with large irregular teeth, occasionally entire or serrulate only at apex; vein narrow, percurrent into a cuspidate apex, or ending below it in the lower leaves. Seta short, immersed, or partly exserted, 1–2.5 mm. long; capsule exserted, large for the size of the plants, nearly 2 mm. long, pyriform when fresh, becoming turbinate and contracted below the mouth and spore-sac when dry, bright orange or brown when mature; mouth bordered by 4–5 rows of narrow elongated cells, and a double annulus, the outer orange-colored, the inner vesicular, hyaline; lid large conic, rostrate when dry, also bordered with orange cells; spores warty, not spinose, .027–.037 mm., maturing in April and May.

Type locality, Colorado, T. S. Brandegee, April 13, 1877, Eu. herb, E. A. Rau; also collected at Great Falls, Montana, on muddy banks of the Missouri River, by R. S. Williams, May 11, 1887, ex. herb. D. C. Eaton.

Resembling *Pyramidula tetragona* in the large size of the capsule as compared with the small size of the plants, but distinguished by the lobate calyptra and double annulus.

PHYSCOMITRIUM CALIFORNICUM n. sp

(Plate 203.)

Autoicous, the antheridial terminal, becoming lateral by innovations. Plants gregarious, 10-15 mm. high; stems simple, erect, short, 3 mm. high; leaves few, basal, oblong-lancealate, 3 mm. long, bordered by a double row of elongated cells, entire or occasionally serrulate above the middle; vein thick, ending below the acute apex; cells lax, oblong, marginal obliquely septate. Seta 1–2 cm. long, slender, twisted, often brown; capsules small, 1–1.5 mm., globose when mature and empty, more or less cylindric when young; lid conic, short blunt; neck short, wrinkled and contracted below the spore-sac when dry, stomatose; mouth bordered by a narrow orange-colored annulus, and 5–11 rows of slightly denser, scarcely differentiated cells; calyptra cucullate, lobed and long beaked; spores brown, .027–.035 mm. warty, not spinose, maturing in Spring.

On the ground in California (Bolander), without date or locality. Specimens received from the Department of Agriculture in 1889, in a set of Bolander's duplicates, and also to be found in the Lesquereux herbarium, as we learn from M. Cardot.

Differing from *P. acuminatum* in the shape of the capsule and length of the seta, having the slender aspect of *Entosthodon ericetorum*, but with a lobed calyptra, entire leaves, and no trace of a peristome. We have thought it best not to use the original manuscript name which I gave it (*sphærothecum*), as there is a European species *P. sphæricum*, which is named in reference to the globose capsules and a Mexican species, *P. subsphæricum*, Sch.

The following key is given to facilitate the determination of the species of this genus. Only six, of the eleven here enumerated, are known to occur within our limits, *P. turbinatum*, *P. acuminatum*, *P. Drummondii*, *P. immersum*, *P. Kellermani* and *P. Hookeri*. Two are Rocky Mountain species, *P. pygmæum and P. Coloradense;* two are Pacific Coast species, *P. megalocarpum* and *P. Californicum;* and *P. australe*, although here maintained as a species, more specimens may perhaps show that it is only an extreme form of *P. turbinatum*, into which it grades through the variety *Langloisii*. Collectors in our Southern States will do well to observe this species carefully and try to get its extreme forms. *P. Drummondii* may be said to be intermediate between *P. turbinatum* and *P. lanceolatum*, and probably ranges northward through the Mississippi Valley. Spore characters have never been carefully recorded heretofore, and these seem to furnish valuable assistance in determining the species which resemble each other.

Key to the North American Species.

Plants 5–10 mm. high, capsules immersed, bordered by two rows of cells.
1. *immersum.*

Plants 3–5 mm. high, capsules exserted, bordered by 4–7 rows of cells.

Annulus narrow, persistent, leaves serrate,

Plants 2–3 mm. high, seta short, almost immersed, stems leafy.
2. *pygmæum.*

Plants 3–5 mm. high, acaulescent, seta exserted, 1–3 mm. long.
3. *Kellermani.*

Annulus double, persistent or falling, leaves entire,

Plants 3–4 mm. high, seta short, immersed, capsule pyriform.
4. *Coloradense.*

Plants 5–10 mm. high, seta 2–3 mm., exserted, capsule turbinate.
5. *Hookeri.*
Plants 5–13 mm. high, seta 5–13 mm., mouth bordered by 6–8 rows.
Leaves acuminate, entire, lid blunt, spores .014–.021 mm., spinose.
6. *acuminatum.*
Leaves acute, serrate, lid rostrate, spores .040–.045 mm., warty.
7. *Drummondii.*
Plants 20–30 mm. high, mouth bordered by 4–8 rows of cells,
Stems tall, leafy, branching, seta curved, spores .037–.042 mm., warty.
8. *australe.*
Plants 5–25 mm. high, mouth bordered by 8–12 rows of cells, spores .027–.035 mm.
Margins serrate, cells inflated, spores spinose, annulus of two rows of cells.
Capsules turbinate, 1–2 mm., mouth flaring, 9. *turbinatum.*
Capsules pyriform, 2–3 mm., urceolate, mouth not flaring,
10. *megalocarpum.*
Margins entire, cells elongated, spores warty, capsules globose.
11. *Californicum.*

The Genus Cassia in North America.*

By Charles Louis Pollard.

Since the publication of Bentham's monograph in 1871†, the genus *Cassia* has received no detailed treatment. The discovery of new material in the South and Southwest during recent years renders a revision of the North American species desirable. The present paper enumerates only those forms which are known to occur north of the Mexican boundary, the numerous tropical species being reserved for later consideration. The classification into subgenera, sections and series is that of Bentham, with such modifications as seemed necessary to adapt it to North American forms exclusively.

Analytical Key to the North American Species.

Leaves with a spinulose rhachis, 27. *C. armata.*
Leaves with rhachis not spinulose.
Leaves 2–9-foliolate.
Peduncles 1-flowered.
Leaves 2-foliolate, 2. *C. pumilio.*

---

* Submitted to the University Faculty of Pure Science of Columbia College as partial requirement for the degree of Master of Arts.

† Trans. Linn. Soc. London, **27**: 503–591.

Leaves 4–8–foliolate.
Leaves coriaceous, 18. *C. Greggii.*
Leaves not coriaceous.
Plant cinereous-pubescent, 17. *C. grammica.*
Plant glabrous, 16. *C. Wrightii.*
Peduncles 2–many–flowered.
Leaves 2–foliolate.
Peduncles 2–flowered, 3. *C. bauhinioides.*
Peduncles several–flowered, 1. *C. Roemeriana.*
Leaves 3–9–foliolate.
Legume turgid, not exceeding 5 cm. in length.
Plant puberulent, 4. *C. crotalarioides.*
Plant silky-pubescent or tomentose.
Leaves 2–3–foliolate, 5. *C. Covesii.*
Leaves 4–6–foliolate, 6. *C. Lindheimeriana.*
Legume exceeding 5 cm.
Petiolar gland wanting, 14. *C. Wislizeni.*
Petiolar gland at base of rhachis.
Stipules filiform.
Leaves 4–6–foliolate, 8. *C. occidentalis.*
Leaves 6–9–foliolate, 10. *C Marylandica.*
Stipules linear, foliaceous.
Legume 20–25cm. long, 7. *C. leptocarpa.*
Legume 8 cm. long, 9. *C. ligustrina.*
Petiolar gland between lowermost pair of leaflets.
Leaflets obovate, 11. *C. Tora.*
Leaflets elliptical.
Peduncles 2–flowered, 13. *C. biflora.*
Peduncles several-flowered,
12. *C. Bahamensis.*
Leaves 6–24–foliolate.
Plants glabrous or subglabrous.
Petiolar gland large, truncate, 19. *C. Chamæcrista.*
Petiolar gland minute, cupuliform.
Flowers pedunculate, peduncles 1 cm. long.
21. *C. Mississippiensis.*
Flowers nearly or quite sessile.
Stipules linear, scarious, 15. *C. calycioides.*
Stipules lanceolate, striated. 22. *C. nictitans.*
Plants hispid or pubescent.
Flowers more than 2–5 cm. broad.
Leaflets small, cinereous, 25. *C. cinerea.*
Leaflets large, glabrate, 20. *C. Chamæcrista robusta.*
Flowers less than 2–5 cm. broad.
Legumes geminate, hispid, 23. *C. aspera.*
Legumes not geminate.

Leaflets tipped with a rigid acuminate point, 26. *C. Simpsoni.*

Leaflets acutely subfalcate, 24. *C. procumbens.*

SUBGENUS I. FISTULA.

Unrepresented in the United States.

SUBGENUS II. SENNA.

Herbs or shrubs, rarely trees. Petiolar gland when present more or less prominent, subglobose, oblong or slender, and stipitate. Flowers in racemes, which often become paniculate or corymbose, usually terminating the younger branches. Stamens 10, the three upper and occasionally a lower one reduced to staminodia; anthers oblong, truncate or more often rostrate at apex, dehiscent by 1 or 2 terminal pores or chinks; base obtuse, more or less bilobed. Legume of variable shape, dehiscent along one or both sutures, more rarely indehiscent; valves inelastic. Ovules funiculate, longitudinal or transverse.

Section A. CHAMÆFISTULA.

Our species all herbs. Leaves inter-glandulose or eglandulose. Perfect stamens 7, staminodia 3. Legume terete, turgid or compressed, usually dehiscent along dorsal suture, more rarely along both sutures. Ovules transverse, separated by septa.

Series *Bacillares*, *Corymbosæ* and *Excelsæ* unrepresented in the the United States.

Series *Brachycarpæ*.

Leaves 2-many-foliolate. Anthers equal, or the 2–3 inferior longer, subrostrate. Legume short, curved or sometimes straight, turgid, submembranaceous, bivalvate. Racemes few-flowered, or when many-flowered becoming corymbose-paniculate.

1. Herbs with perennial rhizome; leaves 2-foliolate.

1. CASSIA RŒMERIANA Scheele.

Cassia Rœmeriana Scheele, Linnæa, **21**: 457 (1848).

Plant of medium height, clothed with closely appressed pubescence, sending up several–many stems from the thick, knotty rhizome; leaflets densely pilose, lance-linear, 3–6 cm. long, .75–1.2 cm. wide, asymmetrical at base, borne on a somewhat elon-

gated rhachis; stipules filiform, persistent; petiolar gland slender, conical, situated between lowermost pair of leaflets; peduncles 2–4 flowered, forming terminal corymbose racemes; sepals ovate, membranaceous; petals strongly veined; legume nearly straight, turgid, mucronate, dehiscent along both sutures; dorsal suture prominent; length 2.5–3 cm., width .5 cm.; seeds numerous.

Texas and New Mexico, extending south into Mexico.

2. Cassia pumilio A. Gray.

Cassia pumilio A. Gray, Bost. Journ. Nat. Hist. **6**: 180 (1850).

Plant low (8–15 cm.), with tufted stems from the long, branching rhizome; stems and leaves sparsely pubescent; leaflets linear, or the earliest obovate (3–3.5 cm. long, 2 cm. wide), slightly shorter than the elongated rhachis; petiolar gland slender, setaceous, situated between lowermost pair of leaflets; stipules acute, linear, membranaceous, persistent; flowers resembling those of *C. Rœmeriana*, but solitary on elongated axillary peducles; calyx persistent; sepals slighty shorter than petals; legume turgid, oval, truncate, finely pubescent; length 1.5 cm., width 7 cm.

West Texas and New Mexico, extending south into Mexico.

3. Cassia bauhinioides A. Gray.

Cassia bauhinioides A. Gray, Bost. Journ. Nat. Hist. **6**: 180 (1850).

Plant of medium height, somewhat branching, densely pubescent, pilose or even tomentose; leaflets oblong-ovate, very asymmetrical at base, canescent beneath, 2–3 cm. long, 1–1.5 cm. wide; petiolar gland setaceous, situated on rhachis just below lowermost pair of leaflets; stipules filiform, persistent; peduncles two-flowered, forming corymbs at the ends of the branches; sepals thin, membranaceous, elliptical; legume villous, compressed, straight or subfalcate, acute, dehiscent along both sutures; length 3–5 cm., width 5 cm.; seeds numerous.

The leaflets are apt to vary in shape and size; in seedling specimens they are nearly orbicular, but later pass into the narrow form.

West Texas, New Mexico and Arizona, extending south into Mexico.

4. Cassia crotalarioides Kunth.

Cassia crotalarioides Kunth, Mimos. 132, *t. 40.* (1819–24.)

Fruticose at base, branching freely; stems and leaves pubes-

2. Shrubs or rarely herbs; leaves 2–many foliolate.

cent; leaves 2–3 foliolate, the leaflets all borne near termination of rhachis; leaflets ovate-elliptical, slightly asymmetrical at base, densely pubescent, acute or obtuse, 2–2.25 cm. long, .7–1 cm. wide; petiolar gland setaceous, situated between lowermost pair of leaflets; stipules long, filiform; inflorescence a corymbose raceme, many-flowered; petals large, conspicuous; sepals smaller, lanceolate; legume turgid, slightly compressed, oblong-oval, (1.75 cm. long, .75 cm. wide,) sparsely pubescent; dorsal suture straight, mucronate-tipped; ventral suture more or less curved; seeds few.

Arizona.—Grand Cañon, Colorado Plateau, Moseley (1884). Kew Herb.; Mexico.

No specimen collected within the boundary limits of the United States exists in the Columbia College Herbarium; but the locality given above, in which it was found by Prof. Moseley when collecting for the Kew Herbarium, leads us to suppose that it occurs in other portions of Arizona and New Mexico.

5. Cassia Covesii A. Gray.

Cassia Covesii A Gray, Proc. Am. Acad. 7: 399 (1868.)

Stems branching from the base; plant thickly clothed with finely appressed, silky pubescence; leaves 2–3 foliolate; leaflets asymmetrical at base, ovate or oblong-elliptical, mucronate, 2.5–3 cm. long, 1.2 cm. wide; petiolar gland setaceous, situated between lowermost pair of leaflets; occasionally an accessory gland of similar appearance is present between second pair; stipules filiform, persistent; racemes numerous, axillary, many-flowered; flowers large; sepals small, ovate-elliptical; legume subterete, acute, many seeded, straight or subfalcate, 3.5 cm. long, 6 cm. wide.

This species is not included in Bentham's monograph. The two specimens in the Columbia Herbarium differ in the degree of pubescence.

Nevada and Southern California extending through Arizona south into Mexico.

6. Cassia Lindheimeriana Scheele.

Cassia Lindheimeriana Scheele, Linnæa, **21**: 457 (1848).

Plant of medium height, branching, silky-pubescent; leaves 4–6-foliolate; leaflets asymmetrical, oval or elliptical, acute or mucronate, white-tomentose beneath, 2.7–3 cm. long, 1.5 cm. wide; petiolar gland setaceous, situated between the next to the

lowermost pair of leaflets; stipules linear, membranaceous; racemes loosely many-flowered, becoming corymbose at terminations of branches; sepals ovate-lanceolate, striated; legume straight, acute, apparently indehiscent, subglabrous, very much compressed, 5 cm. long, .5 cm. wide; seeds numerous.

Texas, New Mexico and Arizona, extending south into Mexico.

Section B. Oncolobium.

Shrubs or herbs. Perfect stamens 7, staminodia 3. Legume turgid or compressed, often arcuate, dehiscent along both sutures, variable in length.

1. Leaves 4–8 foliolate, sharply acuminate; legume linear, elongated.

7. Cassia leptocarpa Benth.

Cassia leptocarpa Benth. Linnæa, **22**: 528 (1849).

Fruticose or suffruticose, tall, branching, pubescent, leaves 5–7 foliolate; leaflets acuminate, lanceolate, basally symmetrical, densely pubescent, 5–6 cm. long, 1.5–1.8 cm. wide; petiolar gland large, sessile, obconical; stipules lanceolate, foliaceous, caducous; inflorescence in short axillary racemes; calyx corolla-like, the oval sepals not surpassing the petals; legume narrowly linear, subglabrous, with prominent sutures, 20–25 cm. long, .3 cm. wide; seeds very numerous, quadrilaterally compressed.

New Mexico and Arizona, extending south into Mexico.

8. Cassia occidentalis L.

Cassia occidentalis L. Sp. Pl. 539 (1753).

Tall, annual, herbaceous, glabrous; leaves 4–6 foliolate; leaflets lanceolate, becoming lance-elliptical, subglaucous beneath, 3.6–5 cm. long, 1–2 cm. wide; petiolar glands 2, sessile, conical, situated between lowermost pair of leaflets; stipules filiform, caducous; flowers large, in closely-crowded axillary racemes; sepals rather short, oval or lance-ovate; legume linear, turgid, slightly compressed, glabrous, straight, or arcuate, the sypta externally prominent, 11 cm. long, 6 cm. wide; seeds numerous, parallel with the transverse septa.

Virginia and Southern Indiana, southward into Mexico. (Adventive or naturalized from Tropical America.)

9. Cassia ligustrina L.

Cassia ligustrina L. Sp. Pl. 541 (1753.)

Herbaceous, glabrous; stem with prominent longitudinal

2. Leaves 6–9 foliolate; leaflets acute.

ridges; leaves 6–8-foliolate; leaflets lanceolate, glabrous, 4–4.2 cm. long, 1 cm. wide; petiolar gland at base of rhachis, elongated, stipitate; stipules linear, membranaceous, caducous; racemes few-flowered, forming a corymbose panicle; sepals oval, membranaceous, shorter than the petals; legume flat, glabrous, with slightly sinuate sutural margins, 8 cm. long, .6 cm. wide; seeds parallel with the valves.

Florida, extending south into the West Indies and widely distributed in Tropical America.

10. Cassia Marylandica L.

Cassia Marylandica L. Sp. Pl. 541 (1753).

Tall, branching, herbaceous, glabrous; leaves 6–9-foliolate; leaflets acute-elliptical, submucronate, glaucous beneath, slightly asymmetrical at base, 4–5 cm. long, 1.4 cm. wide; petiolar gland obconical, stipitate, situated a short distance above base of rhachis; stipules filiform, ciliate, caducous; racemes short, many-flowered; sepals oval, more or less petal-like; legume falcate, flat, linear, somewhat hispid, with septal constrictions forming undulate sutural margins, 10–12 cm. long, .6 cm. wide.

Southern Connecticut, extending south to Florida and west to Nebraska, Kansas and Louisiana.

Section C. Proscsperma.

Shrubs or herbs. Perfect stamens 6 or 7; staminodia 3. Legume linear, tetragonal, straight or curved, dehiscent along both sutures.

Series *Toræ*.

Peduncles short, 1–2 flowered; leaves 2–3 foliolate.

11. Cassia Tora L.

Cassia Tora L. Sp. Pl. 538 (1753).

Tall, glabrous, herbaceous; leaves 2–3-foliolate, glabrous or pubescent beneath; leaflets obovate-elliptical or wedge-obovate, very slightly cuspidate, the terminal pair much the largest, all symmetrical or nearly so at base, 3–5 cm. long, 2.5 cm. wide; petiolar glands slender, elongated, situated between lowermost pair of leaflets; stipules long, linear, persistent; racemes loose, few-flowered; flowers large; sepals oval, membranaceous; legume

long, linear, acute, falcate, more or less tetragonal, glabrous, 16–18 cm. long, .3 cm. wide; seeds numerous, large, quadrilaterally compressed.

Southern Virginia, extending south to Florida and Cuba, west to Southern Indiana and Arkansas. Also in Tropical America.

Series *Confertæ*, *Laxifloræ* and *Coriaceæ* unrepresented in the United States.

Section D. CHAMÆSENNA.

Shrubs or rarely herbs. Perfect stamens 7 (rarely 6), staminodia 3. Legume compressed, dehiscent by both sutures. Seeds transverse or oblique.

A. *Leaves interglandulose, or glands sometimes wanting.*

Series *Pachycarpæ*.

Leaves few–many-foliolate; stipules setaceous or caducous; legume usually with convex valves.

12. CASSIA BAHAMENSIS Mill.

Cassia Bahamensis Mill. Gard. Dict. Ed. 8, No. 9 (1768).

Fruticose, tall, glabrous, or somewhat pilose; leaves 3–5-foliolate, subcoriaceous; leaflets ovate or acutely elliptical, submucronate, 3.5–5 cm. long, 1.6 cm. wide; petiolar gland orbicular, depressed, varying in position from between lowermost pair of leaflets to near base of rhachis; stipules linear, caducous; inflorescence corymbose-paniculate; sepals petal-like; legume linear, flat, with lateral depressions between the seeds, 9 cm. long, .5 cm. wide.

Florida, extending into the Bahamas.

Series *Aphyllæ* unrepresented in the United States.

Series *Rostratæ*.

Anthers of 2–3 lower stamens terminated by a cylindrical, pore-bearing beak. Legume generally narrow, with planular valves. Leaflets few to many, obtuse, or rarely becoming acute. Stipules linear, setaceous or caducous. Peduncles 1–2-flowered, rarely 3–4-flowered.

13. CASSIA BIFLORA L.

Cassia biflora L. Sp. Pl. 540 (1753).

Fruticose, branching; stem glabrous or pilose; leaves 4–10-foliolate, usually pubescent or canescent beneath, sometimes glab-

rous; leaflets oblong-elliptical, acute or obtuse at apex, 4 cm. long, 1.6 cm. wide; petiolar gland stipitate, slender, acute, situated between lowermost pair of leaflets; stipules linear, membranaceous, caducous; peduncles 2-flowered, in close terminal racemes; flowers large; sepals oblong-elliptical, equal in length with petals; legume falcate, narrowly linear, 9 cm. long, .5 cm. wide.

Florida, extending into the West Indies; also in Mexico.

Series *Auriculatæ* unrepresented in the United States.

B. *Leaves eglandulose.*

Series *Floridæ.*

Racemes axillary or corymbose-paniculate. Legume with flat valves, usually elongated.

14. CASSIA WISLIZENI A. Gray.

Cassia Wislizeni A. Gray, Pl. Wright, 1: 60 (1852).

Fruticose, branching; leaves small, glabrous, 4–7 foliolate; leaflets wedge-obovate or oblong-oval, slightly acuminate, 5 mm. long, 3 mm. wide; petiolar gland minute or wanting; stipules aculeate; inflorescence in crowded paniculate racemes, becoming corymbose at terminations of branches; flowers large and conspicuous; legume flat, elongated, with prominent sutures, 9 cm. long, .7 cm. wide; seeds numerous, transverse, causing external swellings on valves.

West Texas and New Mexico, extending south into Mexico.

Series *Pictæ* and *Brachycarpæ* unrepresented in the United States.

Section PSILORHEGMA unrepresented in the United States.

SUBGENUS III. LASIORHEGMA.

Shrubs or herbs, rarely trees. Petiolar glands when present depressed, scutelliform, sessile or stipitate. Stamens 10, all perfect, rarely several wanting or reduced to staminodia; filaments short, anthers oblong-linear, dehiscent by short slits at the apex, more rarely laterally. Legume usually flat, the valves elastic, ventrally and dorsally dehiscent. Seeds transverse or oblique.

Sections APOUCOUITA and ABSUS unrepresented in the United States.

Section CHAMÆCRISTA.

Flowers usually solitary on axillary peduncles. Anthers often unequal.

Subsection *Xerocalyx.*

Sepals subscarious, many-striate. Leaves 1-many-foliolate.

15. CASSIA CALYCIOIDES D.C.

Cassia calycioides D.C. Prod. 2: 503 (1825).

Low, spreading, herbaceous, more or less pilose; leaves 6–15-foliolate, glabrous or subpilose; leaflets linear, finely acuminate, .7 cm. long, .15 cm. wide; petiolar gland slender, cupuliform, stipitate; stipules linear, scarious, persistent; flowers small, solitary on very short axillary peduncles; legume linear, acuminate, pubescent, 4–4.5 cm. long, 5 cm. wide.

Texas, New Mexico and Arizona, extending south into Mexico.

Subsection *Leiocalyx*.

Sepals membranaceous, scarcely striate.

Series *Subaphyllæ* and *Prostratæ* unrepresented in the United States.

Series *Paucijugæ*.

Shrubs or perennial herbs, erect or spreading; leaves 3–7-foliolate, subcoriaceous; petiolar gland small, slightly stipitate.

16. CASSIA WRIGHTII A. Gray.

Cassia Wrightii A. Gray, Pl. Wright, 2: 50. (1853).

Low, branching, herbaceous or suffruticose at base; leaves glabrous, membranaceous, 4–8-foliolate; leaflets elliptical, obtuse or submucronate, .7 cm. long, .2 cm. wide; rhachis short; petiolar gland very small, cupuliform, substipitate; stipules lanceolate; peduncles 1-flowered; flowers large; legume glabrous, linear, acute, 4 cm. long, .5 cm. wide; seeds numerous, oblique.

New Mexico and Arizona, extending south into Mexico.

17. CASSIA GRAMMICA Spreng.

Cassia grammica Spreng. Neue Entd. 3: 55 (1822).

Low, branching, herbaceous or suffruticose at base, densely pubescent; leaves 4–6-foliolate; leaflets elliptical or sub-obovate, mucronate, subcoriaceous, canescent beneath, 1 cm. long, .3 cm. wide; petiolar gland obsolescent, sessile, compressed; stipules aculeate; peduncles 1-flowered; flower large; legume pubescent, linear, mucronate; length (in young specimen) 3 cm., width .4 cm.; seeds few, oblique.

Florida, extending south into Cuba.

Series *Coriaceæ* unrepresented in the United States.

Series *Subcoriaceæ*.

Shrubs or perennial herbs, erect; leaves 3–10-foliolate, obtuse, subcoriaceous; petiolar gland sessile; stipules small.

18. Cassia Greggii A. Gray.

Cassia Greggii A. Gray, Pl. Wright, 1: 59 (1852).

Fruticose, glabrous; leaves 3–5-foliolate; leaflets oblong-oval, slightly truncate, 1 cm. long, 4 cm. wide; nerves prominent; petiolar gland compressed, minute; stipules filiform, often caducous; peduncles 1-flowered; legume not observed.

This species occurs in South Texas, according to Bentham's statement (Monograph, p. 575); but all the specimens which I have examined were collected in Mexico.

Series *Chamæcristæ veræ.*

Herbaceous or suffruticose; leaves 8–20-foliolate, membranaceous; petiolar gland sessile or stipitate; stipules small; legume flat.

19. Cassia Chamæcrista L.

Cassia Chamæcrista L. Sp. Pl. 542 (1753).

Tall, herbaceous, glabrous; leaves 8–12-foliolate; leaflets oblong-elliptical, acute or mucronate, 1.5 cm. long, 3 cm. wide; petiolar gland sessile, comprsssed, cupuliform; stipules lance-linear, membranaceous; peduncles numerous, supra-axillary, 3–5-flowered; flowers large; sepals membranaceous, lanceolate, equalling or exceeding the petals; legume elongated-linear, subrostrate, pubescent, 5 cm. long, .5 cm. wide; seeds numerous, transverse.

Maine, extending south to Florida and west to Minnesota, Kansas and Mexico.

20. Cassia Chamæcrista robusta, n. var.

Tall, branching, herbaceous; stems densely pubescent, stout; leaves glabrate, 10–15-foliolate; leaflets elliptical, basally asymmetrical, obtuse, finely cuspidate, 2 cm. long, .5–.6 cm. wide, occasionally an odd one terminating the rhachis; petiolar gland circular, truncate, compressed, sessile; stipules foliaceous, broadly lanceolate, striated; peduncles 1–3-flowered, supra-axillary, flowers large and conspicuous, red or orange-red; sepals small, membranaceous, lanceolate, only half as long as the petals; stamens 10, 5 larger, 5 smaller, perfect; legume narrow, linear, pubescent, 4 cm. long, .5 cm. wide.

Type a single specimen in the Columbia College Herbarium collected by Dr. C. W. Short in the mountains of Kentucky, and referred by him with doubt to *C. aspera*, with which, however, it has almost nothing in common.

21. CASSIA MISSISSIPPIENSIS n. sp.

Low, branching, suffruticose,; stem terete, glabrous; leaves subcoriaceous, pubescent, 8–14-foliolate; leaflets small, elliptical or obovate, mucronate, basally asymmetrical, 5 cm. long, .1–.15 cm. wide; secondary nerves 3 or 4, opposite, rarely alternate; petiolar gland minute, cupuliform, sessile, situated midway between lowermost pair of leaflets and base of rhachis; stipules acutely linear, membranaceous, persistent; peduncles 1 cm. long, axillary, 1-flowered; flower large (petals 1 cm. long, .3 cm. wide); anthers 10, rostrate, all perfect, the lower 5 larger, yellow, the upper smaller and reddish; anther-sacs dehiscent by terminal pores; sepals lance-linear, slightly pubescent, not surpassing the petals; legume turgid, linear, sparsely pubescent, ventrally and dorsally dehiscent, elastic; length 2.5 cm., width .4 cm.; seeds 4 or 5, ovoid, rather large (longest diam. 3 mm.) transverse.

Type in herbarium of Columbia College, collected by Miss K. Skeehan, 1889, at Ocean Springs, Mississippi.

The specific characters are well-marked, the only *Cassia* to which it bears any resemblance being *C. pygmæa* D.C., a Cuban species, and not reported, so far as I know, from any of the States. *C. pygmæa* may be distinguished by its dense hirsute pubescence, its oblique seeds and fewer pinnæ on the rhachis. The two plants in general external appearance are quite similar.

22. CASSIA NICTITANS L.

Cassia nictitans L. Sp. Pl. 543 (1753.)

Low, herbaceous, branching and spreading freely; leaves glabrous, 6–14-foliolate; leaflets linear-elliptical, acute or mucronate, 1–1.4 cm. long, .2–.3 cm. wide; petiolar gland urceolate, subsessile; stipules small, foliaceous, lanceolate, striated; peduncles 1-flowered, supra axillary; flowers small, inconspicuous, subsessile; legume pubescent, submembranaceous, acute, 3.5 cm. long, .6 cm. wide; seeds few, oblique.

Southern New England, extending south to Florida, and west to Indiana, Kansas and Louisiana.

23. CASSIA ASPERA Muhl.

Cassia aspera Muhl; Ell. Bot. S. Car. & Georg. 1: 474 (1821).

Tall, erect, herbaceous; stem hispid with fulvous hairs; leaves 20–24-foliolate, glabrous; leaflets narrowly linear, acuminate, 1 cm. long, .15 cm. wide; petiolar gland slender, erect, elongated; stipules linear, membranaceous, striated; peduncles 2–3-flowered,

supra-axillary, very short; flowers rather larger than in *nictitans;* legumes usually in pairs, hispid, somewhat obtusely linear, 2.8 cm. long, .6 cm. wide; seeds few, oblique.

Florida—Jacksonville, Curtiss; Key West, Blodgett.

It seems to be the result of carelessness on Bentham's part that he has inserted *C. aspera* Muhl. as a synomyn of *C. nictitans* L. Even if the differences were not sufficiently well marked to warrant the establishment of a species, there could be no doubt whatever that they constituted a varietal distinction. But *aspera* has hispid stems, while *nictitans* is glabrous; the petiolar gland in the one case is slender and elongated, in the other urceolate, subsessile; *aspera* produces pods in pairs, while *nictitans* does not.

C. aspera bears a much closer resemblance to the Cuban *C. patellaria* D.C. than it does to *nictitans;* and the differences are harder to detect. In *patellaria*, however, the venation is radically different, the costa adjoining the superior margin of the leaflets, while in *aspera* it occupies very nearly a medial position. *C. patellaria* is downy-pubescent, not hispid, the flowers are smaller and sessile.

24. Cassia procumbens L.

Cassia procumbens L. Sp. Pl. 543 (1753).

Prostrate, branching from a fruticose base; leaves 18–24-foliolate, pubescent; leaflets very small, linear, acutely subfalcate, .5 cm. long, .1 cm. wide, on a stout rhachis; petiolar gland minute, situated midway between the lowermost pair of leaflets and base of rhachis; stipules cordate, foliaceous; peduncles rather long, 1-flowered, axillary; flower large; legume linear, puberulent, somewhat crisped, with prominent sutural margins, length 3.5 cm., width .4 cm.

Texas—Nealley (1889), extending south into Mexico.

Series *Dimidiatæ*.

Suffruticose or herbaceous, procumbent, rarely erect; leaves 8–30-foliolate, narrow, acute; costa approximating superior margin or coalescing with it.

25. Cassia cinerea Cham. & Schlecht.

Cassia cinerea Cham. & Schlecht. Linnæa 5: 599 (1830).

Suffruticose, branching, puberulent; leaves 10–20-foliolate, clothed with cinerous pubescence; leaflets narrow, linear-falcate, acute, 1 cm. long, .2 cm. wide; petiolar gland small, cupuliform,

stipitate; stipules filiform or linear; peduncles 1–2-flowered, rather short, axillary or supra-axillary; flowers large; legume linear, pilose or sparsely pubescent, rostrate, somewhat elongated, 5–5.5 cm. long, .5 cm. wide, seeds oblique.

Texas (Drummond)—extending south into Mexico.

26. Cassia Simpsoni n. sp.

Low, branching from a fruticose base; stem more or less puberulent; leaves 8–12-foliolate; leaflets glabrous or subglabrous, small, narrowly linear (5 mm. long, 1 mm. wide), tipped with a black, rigid, acuminate point; costa approaching the superior margin; secondaries 4 to 5, oblique, almost parallel with the costa; petiolar gland minute, stipitate, obconical, situated on rhachis just below lowermost pair of leaflets; stipules foliaceous, tipped with rigid acuminate points similar to those on leaflets; flowers sessile or subsessile, somewhat supra-axillary, .5–.8 cm. broad; sepals lanceolate, membranaceous, equalling the petals; legume flat, linear, hirsute, subrostrate, 2 cm. long, .4–.5 cm. wide; seeds few, oblique.

Florida—Big Pine Key, Simpson (May, 1891), No. 174.

Type, three specimens in the National Herbarium, collected by Mr. J. H. Simpson, to whom the species is dedicated. One of these specimens is an entire plant, measuring 21 cm. in height, of very compact, shrubby form. The most prominent specific characteristic is the rigid acuminate point terminating the apices of the leaflets and stipules, a feature not observed in any other *Cassia*.

---

27. Cassia armata S. Wats.

Cassia armata S. Wats. Proc. Am. Acad. 11: 136 (1876).

Herbaceous, puberulent; leaves with an elongated, flattened, spinulose rhachis 4–6 cm. long, often impari-pinnate, 2–7-foliolate; leaflets distributed at irregular intervals on rhachis, alternate or opposite, ovate or sometimes crescentic in outline, subcoriaceous, .5 cm. long, .3 cm. wide; petiolar gland and stipules wholly wanting; flowers rather large, numerous in elongated axillary racemes; pedicels slender, subtended by rigid aculeate bracts; perfect stamens 7, staminodia 3; mature legume not observed.

Nevada—Wheeler (1872).

California—Palmer (1876); San Diego, Orcutt (1889).

Arizona—Mohave Desert, Mr. and Mrs. Lemmon (1884).

In none of the specimens in the Columbia College Herbarium, or those in the Department of Agriculture, are mature pods repre-

sented. The young pod, according to Watson's description, is "stipitate glabrate, linear, acuminate, compressed, the sutures thick and nerve-like," a set of characters that might be applied to almost any *Cassia*. The two detached pods on a sheet in the Department of Agriculture Herbarium, collected by Wheeler in Nevada, apparently do not belong to the genus at all, but as Mr. Coville has remarked, seem to be those of *Acacia Greggii*.

Until this odd species can be more carefully examined, it has been thought best not to include it in the regular sequence. While belonging to the subgenus *Senna*, it is not referable to any of Bentham's sections.

Steps toward a Revision of the linosporous Species of North American graminicolous Hypocreaceæ.

By Geo. F. Atkinson.

Certain of the linosporous species of Hypocreaceæ present such a similarity in the character of the asci and spores that some uncertainty seems to exist regarding the generic relationship. This has led to the incorporation of some species under the same genus without regard to certain well-defined and important differential characters of the stroma. In the study of several species collected in Alabama my attention has been called to these peculiarities, and this step toward a revision of the species is offered here as a contribution upon the subject.

The genus *Epichloë* Fr. is here restricted to those characters of the stroma of which *E. typhina* is the type.

The genus *Hypocrella* was erected by Saccardo to include species with quite a variety of stroma but which in contradistinction from *Epichloë* was disciform, and did not surround the host, or substratum, as *E. typhina* does. The new genus *Dothichloë* is here proposed for those species of *Hypocrella* which possess a dothidiaceous stroma and are represented by forms like *Epichloë Hypoxylon* Pk.

Hypocrea tuberiformis B. & Rav. with linear spores is made the type of another genus, for which the name *Echinodothis* is proposed.

The characters of these two new genera may be given as follows:

DOTHICHLŒOE Atkinson.

Stroma dothidiaceous, black, hard, especially the outer portions, lighter within, but the dark color is present to a considerable depth, of like structure throughout though varying in color, pulvinate, effused, disciform or armillæ-form, partly or entirely surrounding the host or substratum, continuous or interrupted. Perithecia, or ascigerous cells, crowded, confluent with the stroma, immersed, the apex projecting above and giving it a granulose, rugose, or convolute appearance. Asci cylindrical, 8-spored. Spores filiform, septate, eventually separating at the septa into short segments.

DOTHICHLOË HYPOXYLON (Pk.).

Epichloë Hypoxylon Pk. 27th Rep. N. Y. State Mus., 108.

Hypocrella Hypoxylon Sacc. Syll. 11: 581.

Stroma 5–20 mm. long, usually occupying one side of the leaf and may be either epiphyllous or hypophyllous, sometimes entirely surrounding the host. Perithecia 100–150 μ. in diameter and nearly twice as long, the conical apices projecting slightly above the stroma give it a granulose appearance. Asci 150–200 × 4–5 μ. linear, tapering to a slender point at the base and crowned by a hyaline truncate apex. Spores nearly the same length as the asci, but 1 μ in diameter, curved and interwoven in the ascus.

This species is very common in the United States upon grasses. *Hypocrea atramentosa* B. & C. Journ. Linn. Soc. 10: 377, is probably also a synonym of this species. What I have taken to be this plant I found very abundant on the under side of the leaves of *Andropogon Virginicus* in Alabama. It agrees well with authentic specimens of Peck's species. Ellis also includes in the synonymy of this species *Dothidea vorax, atramentaria* and *pilulæformis* B. & C. *D. atramentaria* B. & C. in Ellis' N. A. F., No. 683, from South Carolina is certainly the same. The others I have not seen.

Saccardo places *Dothidea vorax, pilulæformis* and *atramentaria* B. & C. in the genus *Ophiodothis* of the Dothideaceæ as *D. vorax* (B. & C.), Sacc. var. *pilulæformis* and var. *atramentaria*, the latter variety referring to No. 100, Rav. F. Amer. The specimen which I have seen of this number of Rav. F. Amer. is mostly immature, but sufficiently developed to identify it as the same species as *D. atramentaria* B. & C. in Ellis N. A. F. No. 683, and also identical

with the *Dothichloë Hypoxylon* (Pk.), as above described. Saccardo's genus *Ophiodothis* is characterized as possessing continuous spores. This together with the different character of the stroma of such species as *O. Haydeni* (B. & C.) distinguishes it from *Dothichloë*.

DOTHICHLŒ ARISTIDEÆ n. sp. Stroma dimorphic, sterile portion confluent, forming a thin black layer, in the specimens seen entirely surrounding the culm. Fertile portion much thicker, confluent or interrupted, forming small perpendicular elevations on the sterile portion, projecting apices of the crowded perithecia more or less confluent in an irregular manner giving a rugulose or convolute appearance to the stroma. Otherwise as in *D. Hypoxylon*. On *Aristida purpurascens*, Auburn, Ala. Collected by B. M. Duggar.

The simple agreement in character of the asci and spores of these species cannot be taken as of specific identity where there are other characters sufficiently distinct, for there is no appreciable difference between the asci and spores of *Epichloë typhina* and those of *Dothichoë Hypoxylon*, and in several species of *Cordyceps* they are very similar.

Epichloë strangulans (Mont.) Sacc., which according to Saccardo is dothideaceous in color, may belong to this genus, but I have not seen the plant.

There may be some question as to the proper location of the genus *Dothichloë*, whether it should remain in the Hypocreaceæ or be transferred to the Dothideaceæ.

ECHINODOTHIS Atkinson.

Stroma subcarnose, of corky consistence, pulvinate, light colored, tuberculate and constricted at base, or disciform, or irregular, partly or sometimes entirely surrounding the host, or substratum, composed of several layers, or strata, of different consistence. Perithecia subcylindrical, sessile, giving an echinate appearance to the stroma. Asci cylindrical, 8-spored. Spores linear, septate, at length separating at the septa into short segments.

ECHINODOTHIS TUBERIFORMIS (B. & Rav.).

Hypocrea tuberiformis B. & Rav. Grev. **4**: 13.

Hypocrella tuberiformis Atkinson, Bot. Gaz. **16**: 282 (1891).

Stroma subglobose, simple or lobed, irregular, usually seated upon one side of the culm but occasionally entirely surrounding it, fastened to the substratum by whitish radiating threads. When

young conidiophorous, covered with needle-shaped basidia 35–40 × 2–3 μ, bearing oval or broadly fusoid conidia, 3.5–4 × 7–10 μ. When mature composed of three strata of different color, the inner whitish tinged with pink, intermediate layer light ochre, and outer layer cinnamon. The intermediate layer is less compact than the other two. Perithecia 1 mm. long by one-third millimeter in diameter, singly or in groups of 3–4 or 20, or crowded, sometimes branching below. Asci large, 450–750 × 14 μ, tapering to a slender point at base, more gradually toward the somewhat enlarged, conoid, truncate apex. Spores pluriguttulate as well as pluriseptate, nearly as long as the ascus. On stems of *Arundinaria macrosperma* var. *suffruticosa*, Ala. and S. C.

Among the other material collected in Alabama is a graminicolous fungus, which at the time of collection I took to be, from its external appearance, the same as *Dothichloë Hypoxylon*. Upon examination it proves to be very different, and is the type of a new genus for which the name *Myriogenospora* is here proposed. Although the spores are not strictly linosporous and the species belongs plainly to the Dothideaceæ, it seems well to characterize it here.

MYRIOGENOSPORA Atkinson.

Stroma pulvinate, effused, carbonaceous. Perithecia immersed, confluent with the stroma, crowded, apex not very prominent. Asci subcylindrical, many-spored. Spores slender, continuous, hyaline.

Myriogenospora Paspali n. sp.

Stroma one to two centimeters long, seated upon one side of the young culm in the cases observed, and partly enclosed on the sides by the equitant leaf blade. Perithecia large, 200–300 μ in diameter, oval or obovate, projecting above the stroma but little by a small conical apex producing a slight unevenness of the surface. Asci large, 200–250 × 15–20 μ, tapering each way to slender ends, more strongly so at the base, so that they appear oblanceolate in side view. Spores very numerous, several hundred, narrowly apiculate, 15–25 × .5–.8 μ, fusoid, straight or slightly curved. On *Paspalum læve*. Auburn, Ala., collected by B. M. Duggar.

Botanical Department, Cornell University.

Teratological Notes.

By Hermann Schrenk.

(Plate 204.)

In growing a number of seedlings for physiological experiments, some curious forms of the common bean (*Phaseolus vulgaris*) were found.

The first was a case of division of the embryo into two unequal halves, which, although they were united, seemed to grow independently. The hypocotyle had been divided, and to each half one cotyledon was attached, while the plumule remained entire and was joined to one-half of the hypocotyle (Figs. 1 and 2). In germinating both halves of the hypocotyle broke through the seed-coats, but one of them (r), grew very much faster than the other. The result was that the smaller half with its cotyledon and the plumule was pushed above the soil (s. p. h.). When the plant was about one inch in height, the smaller hypocotyle produced two thick prong-like roots, but several days passed and still the plumule showed no signs of activity. The other half meanwhile was growing vigorously, the cotyledon markedly diminished in size, and a bud appeared at the union of the hypocotyle with the cotyledon (*b*. Fig. 2). This increased in size and began to unfold; a small leaf appeared similar in shape to the primordial leaves. Another bud was formed, but it was weak and never developed.

The smaller half had grown very little, the hypocotyle thickened somewhat, but otherwise no change took place. From this it would seem that there had been no passage of nutritive material or water from the part of the plant connected with the soil to the other half, in other words, the two parts appeared like separate individuals. After eight days the smaller half showed signs of wilting. With a sharp razor the cotyledon (*s*), the plumule (*p*) and hypocotyle (*h*) were cut from the other half of the hypocotyle (*r*) and were planted in rich soil. The next day the plumule began to unfold, the two primordial leaves spread out, but they remained small and developed no further. The whole died shortly after. The roots produced by the hypocotyle had no doubt been weak-

ened by the week's exposure to the air (although kept in a very moist atmosphere), and were no longer capable of absorbing.

Some twenty or thirty seeds were found that had three cotyledons. The majority of these developed three primordial leaves instead of two (Figs. 3 and 4). Two of the three cotyledons were of approximately the same size, and were situated on the first node, about sixty degrees apart. The third cotyledon was somewhat smaller than the other two and was placed a little above the node, midway between the others. The plumule had the three primordial leaves fully formed in each case examined; they were in a whorl and alternated with the cotyledons. The bud situated between them elongated, but, instead of a single three-parted leaf being formed at the third node, two opposite leaves appeared. In some of the seedlings two buds were situated between the whorl at the second node, each of which formed an internode, at the end of which was a three-parted leaf. From this point each stem grew regularly, giving rise to a twining stem bearing alternate leaves. Six of the plants were allowed to flower and ripen their seed; the latter were planted, but not one of the forty-four seeds grew into seedlings with more than two cotyledons.

An interesting case of polyembryony was met with in two seeds of the Indian corn (*Zea Mays*) (Figs. 5 and 6). Two hypocotyles ruptured the seed coats about the same time, and the following day two plumules made their appearance. One of the seeds was allowed to grow. Both plumules formed healthy leaves, the hypocotyles developed strong roots, and to all appearances both plants were as vigorous as if they had been grown from separate seeds.

Description of Plate 204.

FIGS. 1 and 2.—"s," cotyledon of smaller half; "l" cotyledon of larger half; "p," plumule; "h," smaller hypocotyle; "r," larger hypocotyle; "b," bud (×2).

FIG. 3.—Bean with three cotyledons; seven days old.

FIG. 4.—Bean with three cotyledons; two days older.

FIG. 5.—Front view of corn. "b," larger plumule; "s," smaller plumule just breaking through the coats. "t," smaller hypocotyle; "c," larger hypocotyle.

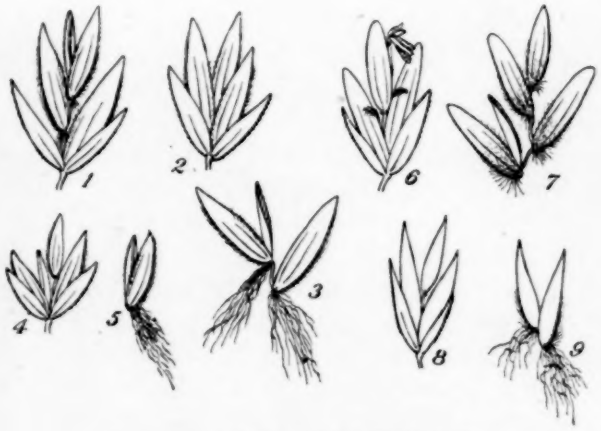
FIG. 6.—Side view of corn. (Same lettering as Fig. 5.) (×2)

BOTANICAL LABORATORY, Cornell University.

Three new or noteworthy Grasses.

By F. Lamson-Scribner.

Some ten or twelve years ago Mr. J. Wolf collected in Illinois a *Poa* which was thought to be only a form of *Poa alsodes* by Dr. A. Gray and a variety of *P. flexuosa* Muhl. by Dr. Vasey. Specimens thus ticketed by Dr. Vasey are in my herbarium and in the herbarium the University of Tennessee, and similar specimens collected by Wolf which are ticketed in Dr. Vasey's hand writing, "*Poa alsodes* var. *Wolfii*." In working up the *Poas* for "The Grasses of Tennessee" I find that Dr. Gattinger collected the



Figs. 1–5. Spikelets of *Poa Wolfii* Scribn.
Figs. 6, 7. Spikelets of *Poa flexuosa* Muhl.
Figs. 8, 9. Spikelets of *Poa alsodes* A. Gray.

grass in question several times within the State. The first specimens are marked "Lavergne, May, 1882," the last "Cedar glades, Lavergne, 1890." Finding these specimens among our Tennessee plants led to a close examination of the characters of the grass with the result that it appears to the writer to be quite distinct and readily separable from either *P. flexuosa* Muhl. or *P. alsodes* Gray.

The species is thus characterized: A slender perennial, 1–3 feet high with a loose nodding panicle. Leaves 1–2 lines wide, 3–6

inches long; sheaths rather loose, mostly shorter than the internodes, the lower scarious; ligule ½ lines long; panicle slender, lax, 3–6 inches long, primary branches 2–3 rarely more at each node of the main rhachis; spikelets ovate, 2–3 lines long, 3–5-flowered; rachilla often flexous; empty glumes sub-equal, 3-nerved; flowering glumes strongly carinate, lanceolate, 5-nerved, silky-villous along the margins and keel and with a copious, long web at the base.—Ill., Tenn., Kansas.

FESTUCA SHORTII Kunth; Wood, Class Book, 794 (1863).

Allied to *F. nutans* Willd. Spikelets 3–4-flowered, ovate, broader above, 2–3 lines long, usually much exceeding the pedicels in length. Empty glumes lanceolate, acute, slightly unequal, the first 1-nerved, 1¾ lines long, the second 3-nerved, 2 lines long, nerves scabrous; flowering glume ovate-oblong, obtuse, obscurely 5-nerved, smooth or minutely roughened on the keel near the apex, more or less rounded on the back. Palea broad, strongly 2-keeled, about equalling the glume. Grain obovate, pubescent at apex, lodicules smooth. Panicle shorter than in *F. nutans*, 4–8 inches long, the broader spikelets more crowded at the extremities of the ascending branches. In the mature specimens the spikelets are turgid and the florets have the appearance of being oblong and very obtuse.

FIG. 1. Spikelet of *Festuca Shortii*.
FIG. 2. Spikelet of *Festuca nutans*.

Kunth is cited by Dr. Wood as the author of *F. Shortii*, but I do not find this name in any of Kunth's writings. Probably it is an herbarium name. An examination of Wood's herbarium or the herbarium of Dr. Short, which is at the Philadelphia Academy of Natural Sciences, may serve to settle this point. In later writings Wood reduced the species to a variety of *F. nutans*. In his "Flora Atlantica" (1879), he calls it *F. nutans* var. *palustris* (p. 399). It is, I think, a good species, readily distinguished from *F. nutans* by its less elongated panicle, more crowded and much broader spikelets.

UNIOLA LONGIFOLIA Scribn. n. sp.

Lower culm-leaves a foot long or more, 3–5 lines wide; sheaths elongated, concealing the nodes, somewhat compressed and more or less villous with a dense ring of soft short hairs at

the summit. Inflorescence as in *U. laxa* (*U. gracilis*), but with the main axis and branches stouter and more rigid, and the spikelets somewhat larger.

Little Stone Mountain, DeKalb county, Georgia, July (John K. Small); Florida (Curtiss N. Am. Pl., No. 3521); Mississippi (S. M. Tracy); Hiawassee Valley, Tenn. (A. Ruth); Tullahoma, Middle Tenn. (A. Gattinger).

Death of Dr. Thomas Morong.

Dr. Thomas Morong, Curator of the Herbarium of Columbia College, and a Vice President of the Club, died at his son's home in Boston, Mass., April 26th, 1894, after an illness of some four months. An account of his life and botanical works will appear in the June number of the BULLETIN.

Botanical Notes.

A New Systematic Botany of North America is announced under the editorship of George F. Atkinson, Cornell University, Ithaca, N. Y.; Nathaniel L.Britton, Columbia College, New York City; John M. Coulter, Lake Forest University, Lake Forest, Ill.; Frederick V. Coville, U. S. Department of Agriculture, Washington, D. C.; Edward L. Greene, University of California, Berkeley, Cal.; Byron D. Halsted, Rutgers College, New Brunswick, N. J.; Arthur Hollick, Columbia College, New York City, and Lucien M. Underwood, De Pauw University, Greencastle, Ind. The editors are already assured of the coöperation of over forty American botanists.

The general sequence of orders will be based on that adopted by Professors Engler and Prantl in their "Natürliche Pflanzenfamilien," now approaching completion, and the work will be

divided into seventeen volumes, and issued in parts averaging about 100 pages each. About five of these parts will constitute each volume. Printed schemes giving the proposed sequence of orders and contents of volumes may be had on application to the Chairman of the Board of Editors.

No illustration is contemplated, but copious references to published plates and figures will be made a feature. In addition to the technical characterizations, chapters dealing with the economic, palæontologic and horticultural aspects of each order will be appended. Especial attention will be given to the verification of original descriptions, to the examination of type specimens, to the citation of type localities and to geographical distribution.

No attempt will be made to treat the groups consecutively, but the sequence of orders being tentatively established in advance, and the number of genera and species being approximately known, it is possible to print parts of all the volumes, or of as many of them as is desired, at about the same time. It is hoped that five or six parts can be issued annually, beginning in 1895. Several parts are already in preparation.

Each monographer will be responsible for his own matter, the only restrictions placed on contributors being that they conform to a general style, to principles of nomenclature and to citations, and that descriptions be extended only to an average limit of a certain number of words, this number to be hereafter determined. The treatment of these matters will be indicated by sample sheets which will be distributed at an early date. It is expected that an approximately uniform consideration of species can be secured.

The editors believe that by prosecuting the work in the manner above indicated, it will be possible to produce a complete Systematic Botany of the country within fifteen years. They fully realize the impracticability of such a task being accomplished by a few students only, and earnestly desire the aid and support of all American botanists. Inquiries and communications may be addressed to any of the editors.

N. L. BRITTON,
Chairman.

CRATÆGUS PUNCTATA CANESCENS n. var.—Under this name I characterize a thorn collected by Dr. Thos. C. Porter at Easton, Pa., and by the late Dr. Robbins at Ferrisburg, Vt. The speci-

mens differ markedly from the type in having the lower surfaces of the leaves, as well as the petioles, peduncles and pedicels, densely white-tomentose. N. L. BRITTON.

Reviews.

Fossil Cycadean Trunks of North America, with a Revision of the Genus Cycadeoidea Buckland. Lester F. Ward (Proc. Biol. Soc. Wash. **9**: 75–87. April 9, 1894).

The author has here gathered together such information as was available regarding fossil cycad trunks found in America. They have been found in the trias of North Carolina and Prince Edward Island and in the lower cretaceous of Maryland and the West. An interesting discovery, showing the value of fossil plants in the correlation of strata, is briefly alluded to. In the Geology of the Black Hills, by Newton & Jenney, no strata below the middle cretaceous (Dakota Group) are recognized. The presence of cycad trunks, however, led the author to infer that strata representing an older geological horizon, must be represented there. An expedition to the locality was accordingly made in company with Prof. Jenney, during the past year, with the result that a conclusion was reached that while the upper part of the strata in question undoubtedly represent the Dakota Group, the lower part probably extend down to the base of the cretaceous—an age equivalent to that of the Maryland strata. Details in regard to the evidence upon which the conclusion was based are promised in a subsequent paper.

The author has also included a revision of the genus *Cycadeoidea* Buckland, in which the nomenclature is revised in accordance with the law of priority. Forty-two species are enumerated, only seven of which are American. One of these is from the Black Hills locality, and is described as a new species under the name *Cycadeoidea Jenneyana.*

Cycadeoidea Carruthersi is proposed to replace *Mantellia intermedia* Carruthers (1870), the trivial name *intermedia* being preoccupied by *Cycadeoidea intermedia* Ranzani (1836). Attention is also called to the fact that Brongniart wrote the genus name

Cycadoidea, merely on the ground of euphony, which of course can not be sanctioned under recently adopted rules of nomenclature, hence Buckland's original name; *Cycadeoidea*, is used by the author, and under it he includes the genera *Mantellia*, *Cycadites*, *Zamites*, *Eucephlartos*, *Clathropodium*, *Strobilites*, *Echinostoipes*, *Bennettites*, *Bolbopodium*, *Raumeria*, *Clathraria*, *Tysonia*, *Cycas*, *Zamiostrobus*, etc., either entire or in part. In the author's words, "This genus seems to be the ultimate destiny of all cycadean trunks of dwarf bulb-like or conical form, deciduous leaf stalks and rhombic leaf scars." A. H.

Annotated List of the Fossil Plants of the Bozeman, Montana, Coal Field, with Table of Distribution and Description of Species. F. H. Knowlton. (Bull. U. S. Geol. Surv. No. 105, pp. 43–63, Pl. V., VI.)

This list contains forty-five species, of which the following are described as new: *Thinnfeldia lanceolata*, *Populus? problematica*, *Litsea Weediana*, and *Cinnamomum ellipticum*—the latter previously identified by Lesquereux with *C. polymorphum* Al. Br. Specimens doubtfully referred to *Equisetum* and *Nelumbo* are also included and *Quercus Paelei*, Lesq., is reduced to identify with *Q. Ellisiana*, Lesq. From an analysis of the table of distribution the fact is adduced that the flora finds its nearest allies in the Denver beds of Colorado and from the stratigraphic relations of the rocks they appear to represent a horizon between the Laramie and the Fort Union beds. A. H.

Proceedings of the Club.

TUESDAY EVENING, APRIL 10, 1894.

The President in the chair and 26 persons present.

Dr. Britton spoke of his announcement at the previous meeting of a probable new species of *Rhamnus* and stated that subsequent observations had led him to consider it probable that this was an introduced species, *R. Frangula L.*

The announced papers of the evening were then read:

(1) By Dr. Britton, "The Morphology and Classification of the Cyperaceæ," illustrated by lantern slides.

(2) By Mr. Theodore G. White, "The Wild Peas of North America." This paper was illustrated by numerous specimens. Mr. White stated that the subject grew in interest the more it was studied, and that he could not even yet present a complete report upon the species, of which, however, he believed there were 30.

WEDNESDAY EVENING, APRIL 25, 1894.

Vice-President Allen in the Chair and 17 persons present.

Reports were received from the Field Committee on meetings held at Lakewood, N. J., and Dunwoodie, N. Y., the latter being cited as a station for *Viola rotundifolia.*

Miss Margaret P. Waterman was elected an active member.

The following papers were read:

"The Genus *Cassia* in North America," by Charles L. Pollard. The paper was illustrated by specimens and diagrams, and is published in the present issue of the BULLETIN.

"Some new and interesting species of *Polygonum*," by John K. Small, illustrated by specimens and drawings. (Published in the April BULLETIN.)

"New species of Characeæ," by Dr. T. F. Allen, illustrated by drawings. (Published in the April BULLETIN.)

Index to Recent Literature relating to American Botany.

Atkinson, George F. Artificial Cultures of an entomogenous Fungus. Bot. Gaz. **19**: 129–135, *pl. 14–16.* 14 Ap. 1894.
Cultures of *Isaria farinosa.*

Atkinson George F. Germination of the Spores of *Cerebella Paspali.* Bull. Torr. Bot. Club, **21**: 127, 128, *pl. 183.* 24 Ma. 1894.
Relationship of plant still uncertain.

Ayres, H. B. A miniature Water Lily. Science, **23**: 109. 1894.
Note on distribution of *Nymphæa odorata* Ait. var. *minor* Sims, in Minnesota.

Bay, J. Christian. Eine neue Infectionsnadel für mykologische Studien. Ber. Deutsch. Bot. Gesel. **12**: 1. 1894.

Bay, J. Christian. On the Study of Yeasts, with Descriptions of the Hansen Culture Box and of a new Infection Needle for the Study of Lower Cryptogams. Am. Mo. Mic. Journ. **15**: 1–11; 33–45. 1894.

Bennett, Arthur. *Potamogeton prælongus* × *perfoliatus*. Britten's Journ. Bot. **32**: 153, 154. My. 1894.
A supposed hybrid from Sicamore, British Columbia.

Bessey, Charles E. The Botany of the Apple Tree. Annual Rep. Nebraska Hort. Soc. reprint, pp. 36. 27 Ma. 1894.

Britton, N. L. Professor Greene and *Jacksonia* and *Polanisia*. Erythea, **2**: 67, 68. 1 Ap. 1894.

Briquet, John. Questions de Nomenclature. Bull. Herb. Boiss, **2**: 49–88. Fb. 1894.

Bush, B. F. Notes on a List of Plants collected in Southeastern Missouri in 1893. Ann. Rep. Mo. Bot. Gard. **5**: 139–153. 1894.

Chalmot, G. de. The Availability of Free Nitrogen as Plant Food: A Historical Sketch. Agric. Sci. **8**: 5–31. Ja. 1894.

Chickering, J. W. The Botanical Landscape. Science **23**: 118. 1894.

Clendenin, Ida. Observations on the Zoospores of *Chætophora endiviæfolia*. Asa Gray Bull. No. 5, 13. 1894.

Danglade, E. M. Corn—a Query. Science, **23**: 109. 1894.

Davidson, Anstruther. Californian Field Notes—III. Erythea, **2**: 61–64. 1 Ap. 1894.
Notes from Big Rock Creek, Los Angeles County.

Deane, Walter. The Ware Collection of Blaschka glass Models of Flowers. Bot. Gaz. **19**: 144–148. 14 Ap. 1894.

Dietel, P. Die Gattung *Ravenelia*. Hedwigia, **33**: 22–48, *taf. 1–5*, 30 Ja. 1894; 49–69, 15 Ap 1894.
Enumerates and describes 7 North American and 7 South American species of the genus of 28 species. Nine American species are described as new, *R. Holwayi*, from California, the remainder South American.

Edwards, Arthur M. Red Snow as seen by Means of the Microscope. Am. Mo. Mic. Journ. **15**: 70–74. 1894.

Farlow, W. G. Notes for Mushroom-Eaters, IV.–VI. Gard. & For. **7**: 63–64, 72, 82. Fb. 1894.
Figures are given of *Coprinus comatus*, *Cantherellus cibarius*, *Boletus subtomentosus*, *Clavaria aurea*, *Scleroderma vulgare* and *Morchella esculenta*.

Ganong, W. F. On the Absorption of Water by the green Parts of Plants. Bot. Gaz. **19**: 136–143. 14 Ap. 1894.
Preliminary experiments render such absorption improbable.

Graves, J. A. Does *Claytonia* develop during the Winter Months? Asa Gray Bull. No. 5, 17. 1894.

Golden, Katharine E. Botany in the Schools. Science, **23**: 119. 1894.

Greene, Edward L. Historical notes of some Californian Trees.—II. Erythea, **2**: 64–67. 1 Ap. 1894.
Notes on the oaks, particularly *Quercus lobata*.

Greene, Edward L. *Jacksonia* but not *Polanisia*. Erythea, **2**: 68 1 Ap. 1894.

Greene, Edward L. Observations on the Compositæ—IV. Erythea, **2**: 53–60. 1 Ap. 1894.
Discussion of facies of *Aster* and *Solidago*. Unites *Aplopappus Parryi* with the latter. Enumeration of species of *Pyrocoma*.

Halsted, Byron D. Shrinking of Leaves in Drying. Bull. Torr. Bot. Club, **21**: 129–131, *pl. 184*. 24 Mr. 1894.

Harshberger, John W. An additional poisonous Plant. Bot. Gaz. **19**: 159. 14 Ap. 1894.
Poisonous influence of *Ranunculus acris*.

Hooker, J. D. *Begonia scabrida*. Curt. Bot. Mag. **50**: *tab. 7347*. 1 Ap. 1894.
A Venezuelan species.

Hudson, Geo. H. An Impeachment of "School Botany." Science, **23**: 103. 1894.

Jack, J. G. Monœcious or polygamous Poplars and Willows. Gard. & For. **7**: 163. 25 Ap. 1894.

Kamienski, F. Neue und unbeschriebene Arten der Gattung *Utricularia*. Ber. Deutsch. Bot. Gesel. **12**: 3. 22 F. 1894.
Utricularia quinqueradiata and *U. Warmingi* n. sp. from Brazil are described.

Langdon, Fanny E. Variations in the Hoods of *Asclepias phytolaccoides* Pursh. Asa Gray Bull. No. 5, 21. 1894.

Loew, O. The Synthetical Powers of Micro-organisms—II. Science, **23**: 144. 1894.

McCluer, G. W. Autumn Coloring of Leaves. Science, **23**: 133. 1894.

Meehan, Thomas. Compass Plants. Bot. Gaz. **19**: 158, 159. 14 Ap. 1894.

Meehan, Thomas. *Dodecatheon Meadia*. Meehan's Month. **4**: 65, *pl. 5*. My. 1894.

Michener, C. The spoken Language of Botany. Science, **23**: 135. 1894.

Osband, Lucy A. A Freak of Inflorescence. Science, **23**: 92. 1894.

Parker, W. Thornton. The Loco-weed. Science, **23**: 101. 1894.

Peckhold, Theodor. Die Brasilianischen Nutz.—und Heilpflanzen. Pharm. Rundsch. **12**: 109. My. 1894.

Plank, E. W. Botanical Notes from Texas—XVII. Gard. & For. **7**: 153. 18 Ap. 1894.

Porter, Thomas C. Notes on certain Plants of our Eastern Flora. Bull. Torr. Bot. Club, **21**: 120–123. 24 Mr. 1894.

Pringle, C. G. Notes of Mexican Travel—VII.–IX. Gard. & For. **7**: 152, 162, 172, *fig. 30, 32.* Ap. and Mh. 1894.
Illustrations of *Vigna strobilophora* and *Tephrosia macrantha.*

Rowlee, W. W. Aeration of Tissues and Organs in *Mikania* and other Phanerogams. Am. Mo. Mic. Journ. **15**: 45–49. 1894.

Sargent, C. S., Editor. A Botanic Garden for New York. Gard. & For. **7**: 181. 9 My. 1894.

Sargent, C. S. *Prunus orthosepala.* Gard. & For. **7**: 184, *fig. 34.* 9 My. 1894.

Sargent, C. S., Editor. The Date Palm. Gard. & For. **7**: 164, *fig. 31.* 25 Ap. 1894.
Illustration and notes of *Phœnix dactylifera.*

Schneider, Albert. Beitrag sur Kenntniss der Rhizobien. Ber. Deutsch. Bot. Gesel. **12**: 11. 1894.

Small, John K. Morphological notes on the genus *Brunnichia.* Bull. Torr. Bot. Club, **21**: 131–132, *2 figs.* 24 Ma. 1894.

Smith, E. F. Memorabilia Botanica.—I.–II. Science, **23**: 80, 115. 1894.

Terry, Wm. A. Diatoms of the Connecticut Shore.—VI. Am. Mo. Mic. Journ. **15**: 74–83. 1894.

Trelease, William. Notes and Observations. Ann. Rep. Mo. Bot. Gard. **5**: 154–166, *pl. 27–32.* 1894.
Notes on *Pachira* sp., *Crassula quadrifida, Cotyledon orbiculata, Cucumis Melo Tillandsia utriculata, Agave parviflora* and *Yucca Guatemalensis.*

Tyler, A. A. An Examination of the Pubescence of the Styles and Filaments of *Lonicera hirsuta* Eaton., *L. Sullivantii* Gray and *L. glauca* Hill. Bull. Torr. Bot. Club, **21**: 123–126, *pl. 181, 182.* 24 Mr. 1894.

Vail, Anna Murray. A Study of the Genus *Psoralea* in America. Bull. Torr. Bot. Club, **21**: 91–119. 24 Ma. 1894.

Revision of genus, with descriptions of the species. *P. Purshii* and *P. Trianæ* are described as new, the latter from New Granada.

Ward, Lester F. Frost-Plants. Science, **23**: 66. 1894.

Weed, Clarence M. The Guests of the Mayflower. Pop. Sci. Month. **45**: 17–23, illustrated. My. 1894.

Whitten, J. C. Phenological Notes at the Missouri Botanic Garden, for 1892 and 1893. Ann. Rep. Mo. Bot. Gard. **5**: 123–135. 1894.

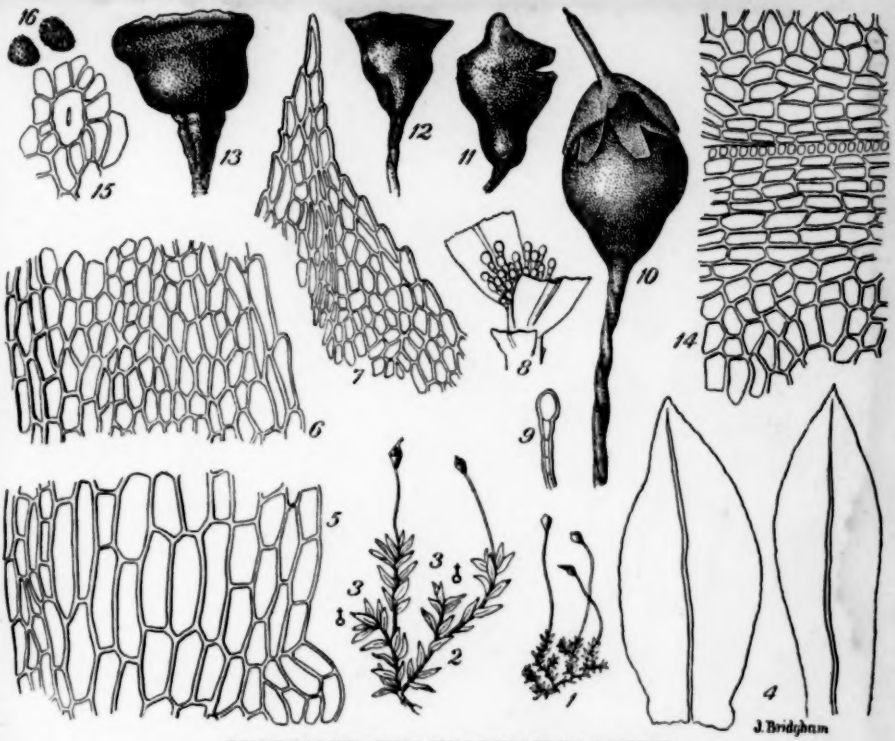
Whitten, J. C. The Emergence of *Pronuba* from the *Yucca* Capsules. Ann. Rep. Mo. Bot. Gard. **5**: 137. 1894.

Wildeman, E. de. *Trentepohlia Pittieri.* La Notarisia, **9**: 6. 1894.

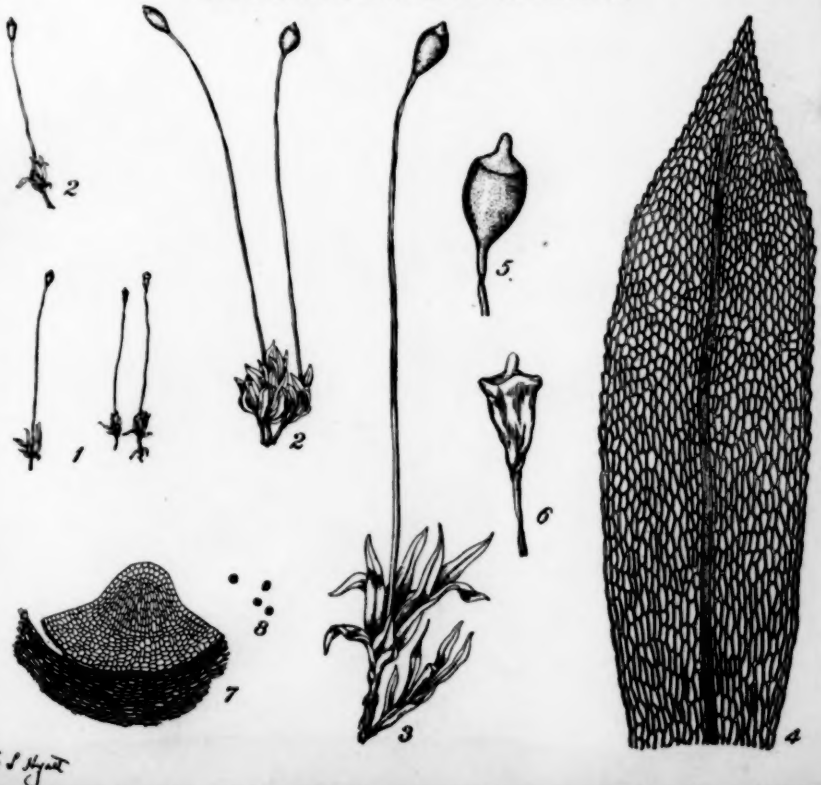
Description of a species from Costa Rica.

Utah 109 Watson 1869
pedicel turns to the left
spores 5μ-6 4750
1-2
7 see a slide of this - no specimens left
109 Physcomitrium pygmaeum

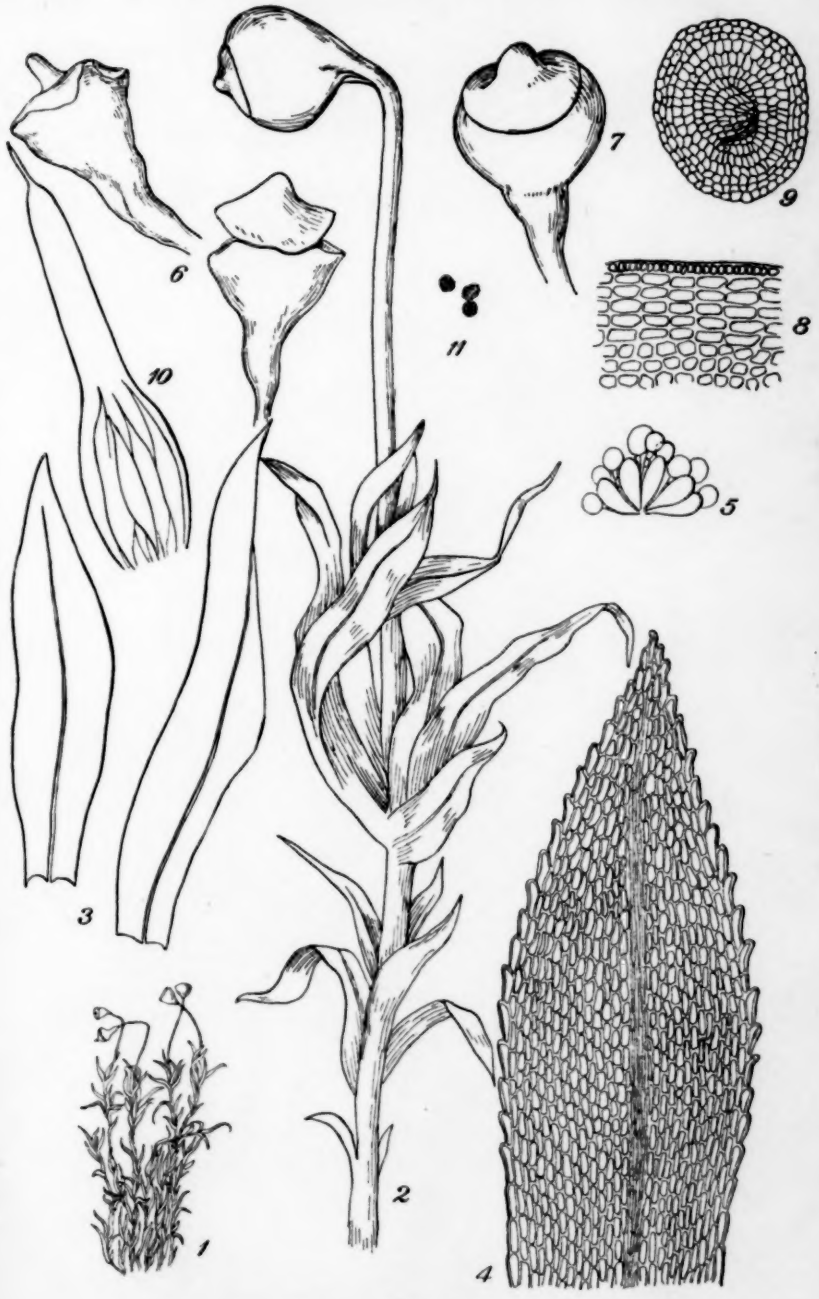
PHYSCOMITRIUM PYGMÆUM JAMES.



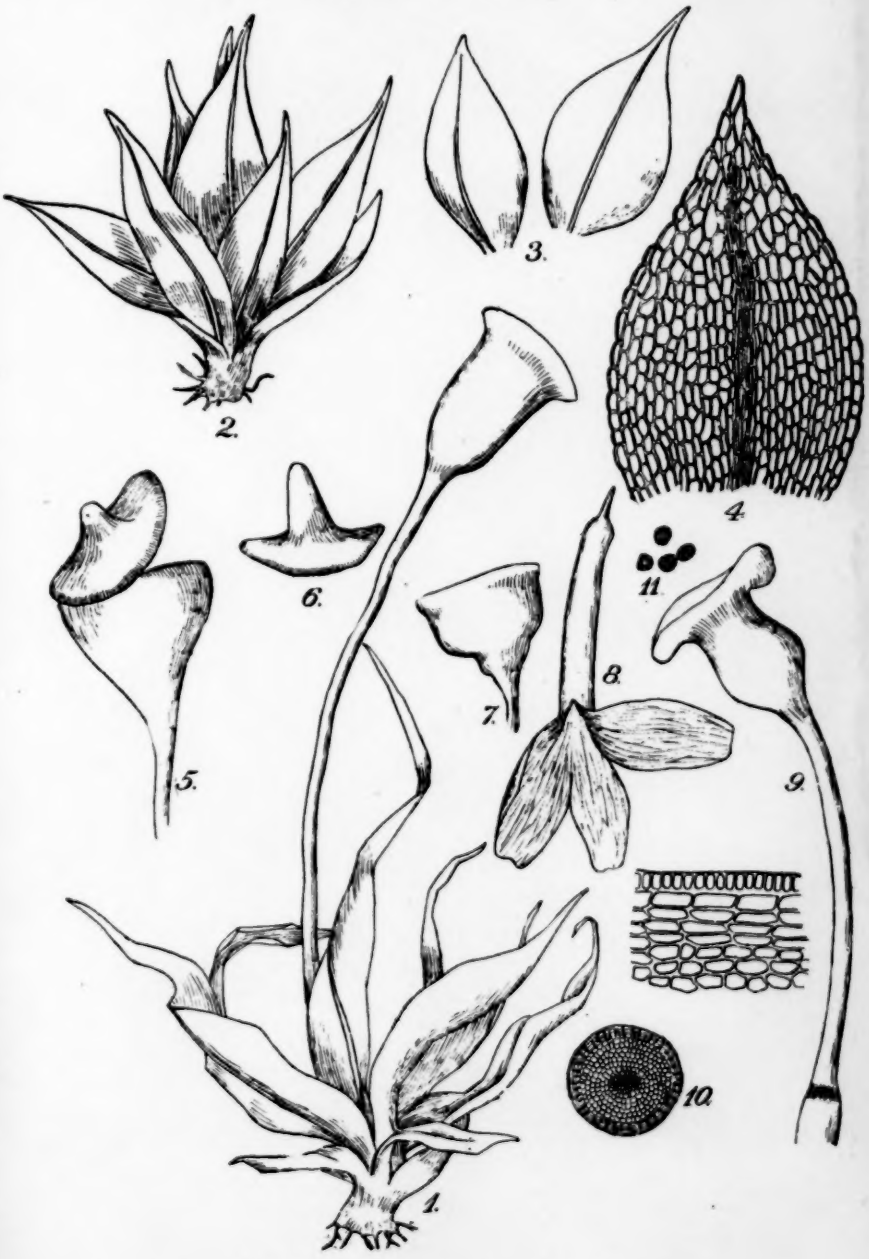
PHYSCOMITRIUM TURBINATUM MICHX.



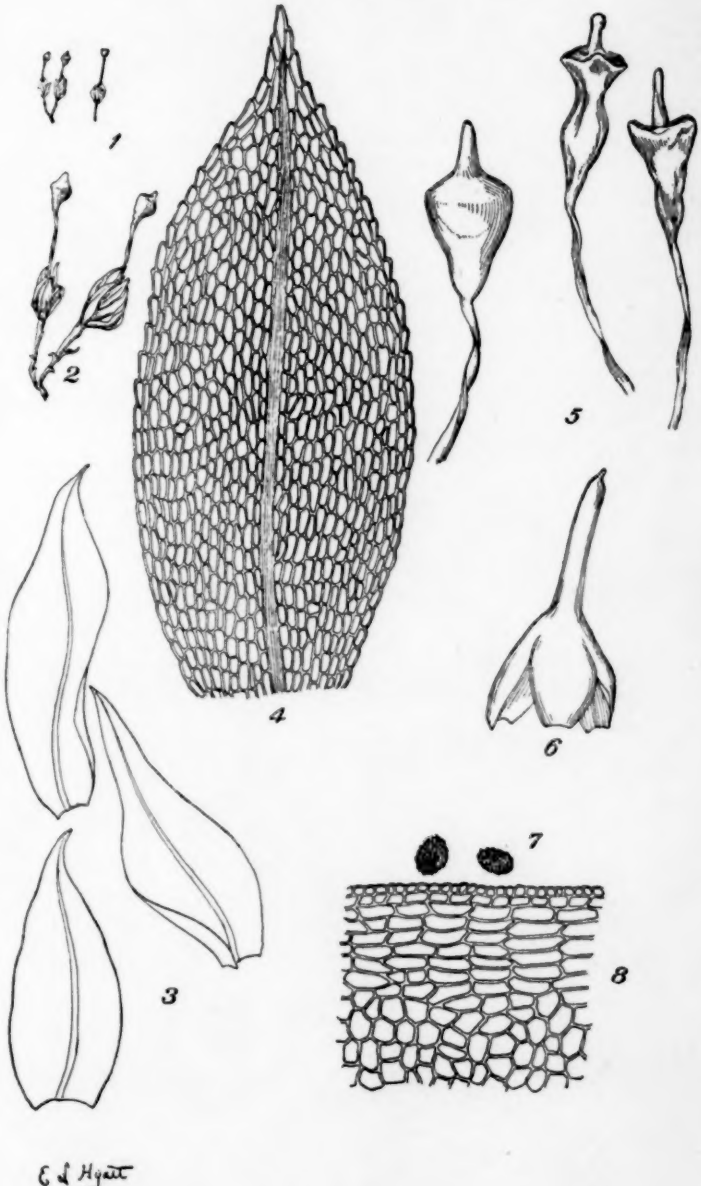
PHYSCOMITRIUM TURBINATUM LANGLOISII (REN. & CARD.) E. G. BRITTON



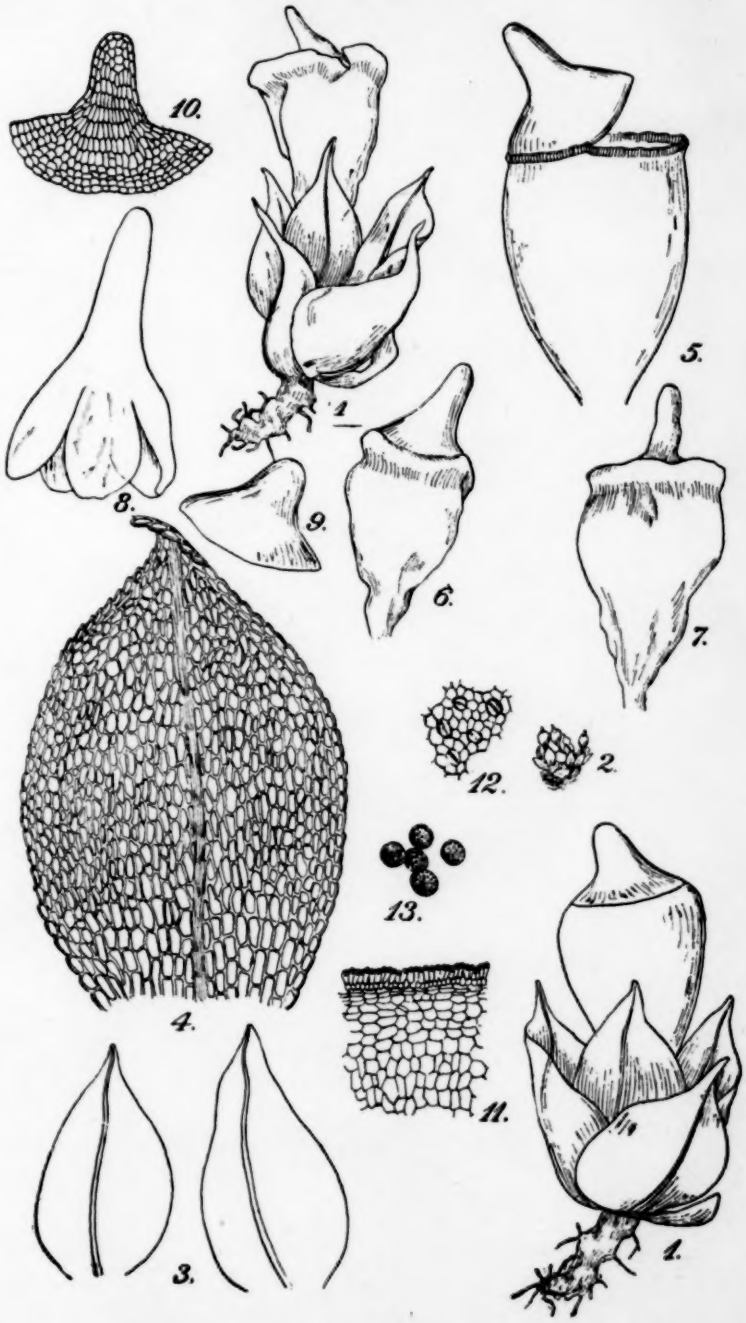
PHYSCOMITRIUM AUSTRALE E G. BRITTON.



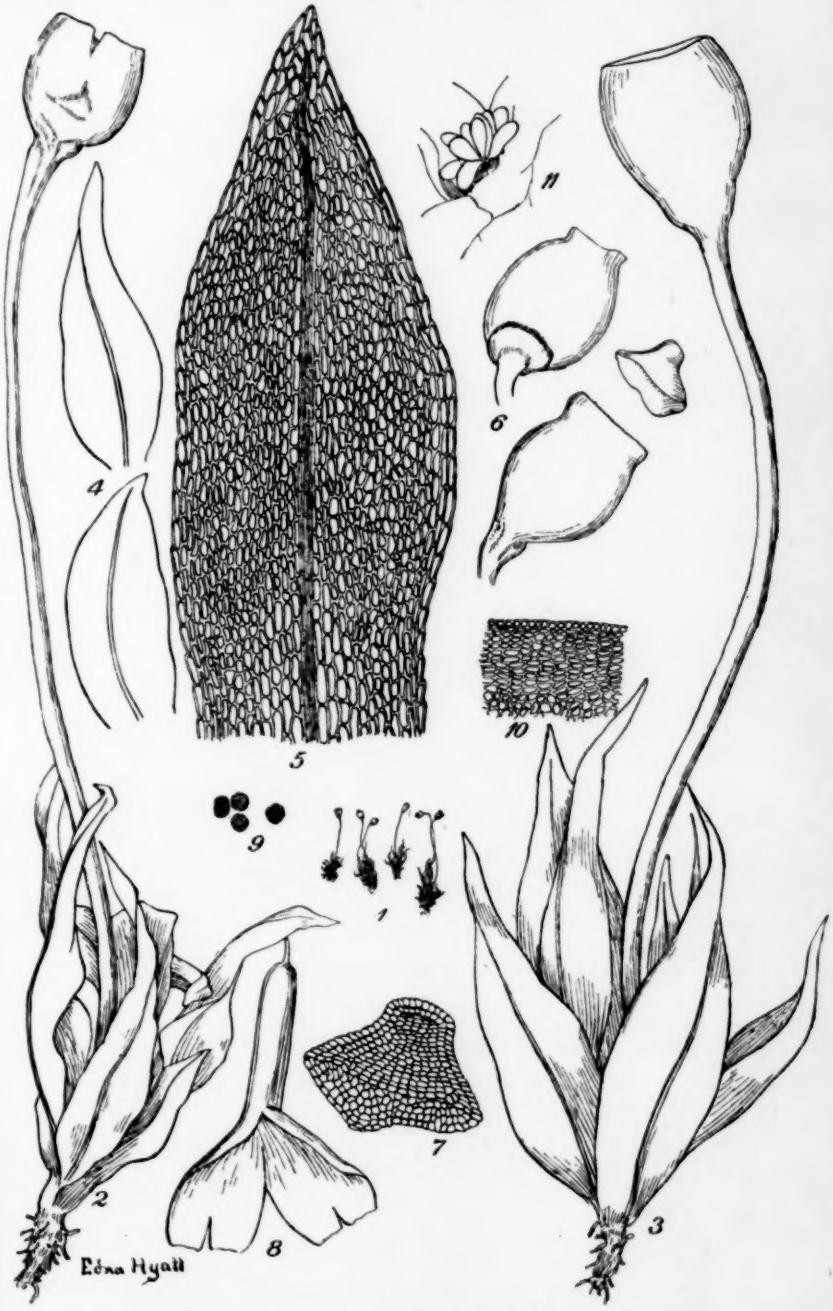
PHYSCOMITRIUM KELLERMANI E. G. BRITTON.



PHYSCOMITRIUM DRUMMONDII E. G. BRITTON.



PHYSCOMITRIUM COLORADENSE E. G. BRITTON.



PHYSCOMITRIUM CALIFORNICUM E. G. BRITTON.

Fig. 1.

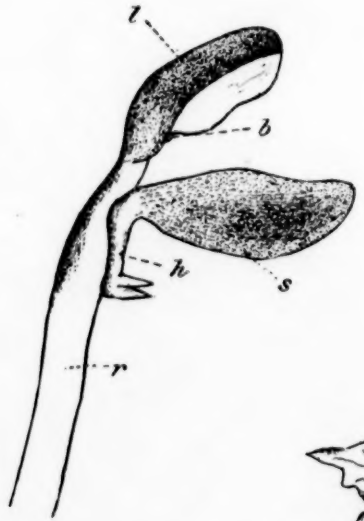


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

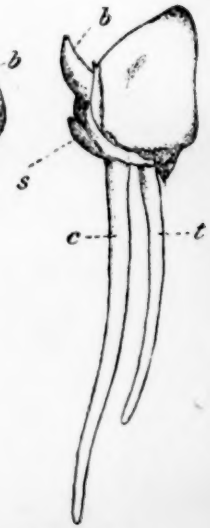


Fig. 6.

TERATOLOGY OF THE EMBRYOS OF PHASEOLUS VULGARIS AND ZEA MAYS.

Contributions from the Herbarium of Columbia College.

[The numbers omitted from this list are out of print.]

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... 25 cents.

No. 5. New or Noteworthy North American Phanerogams. By N. L. Britton (1888), ... 25 cents.

No. 6. An Enumeration of the Plants Collected by Dr. H. H. Rusby in South America, 1886–1887. By N. L. Britton. (Twenty-three parts published; not yet completed.)

No. 7. The Genus *Hicoria* of Rafinesque. By N. L. Britton (1888), . 25 cents.

No. 8. A Recent Discovery of Hybrid Oaks on Staten Island. By Arthur Hollick. (1888), ... 25 cents.

No. 9. A List of Plants Collected by Dr. E. A. Mearns at Fort Verde and in the Mogollon and San Francisco Mountains, Arizona, 1884–1888. By N. L. Britton.

The General Floral Characters of the San Francisco and Mogollon Mountains and the Adjacent Region. By H. H. Rusby (1888), . . 25 cents.

No. 11. Preliminary Notes on the North American Species of the Genus *Tissa*. Adans. By N. L. Britton (1889), ... 25 cents.

No. 12. The Genus *Eleocharis* in North America. By N. L. Britton (1889), 25 cents.

No. 13. New or Noteworthy North American Phanerogams, II. By N. L. Britton 1889), ... 25 cents.

No. 14. A List of State and Local Floras of the United States and British America By N. L. Britton (1890), ... $1

No. 15. A Descriptive List of Species of the Genus *Heuchera*. By Wm. E. Wheelock (1890), ... 25 cents.

No. 16. New or Noteworthy North American Phanerogams, III. By N. L. Britton (1890), ... 25 cents.

No. 17. The Flora of the Desert of Atacama. By Thos. Morong (1891), . 25 cents.

No. 19. Notes on North American Haloragæ. By Thos. Morong (1891), 25 cents.

No. 20. New or Noteworthy North American Phanerogams, IV. By N. L. Britton. (1891), ... 25 cents.

No. 21. Notes on the North American Species of Eriocauleæ. By Thos. Morong (1891), ... 25 cents.

No. 22. New or Noteworthy North American Phanerogams, V. By N. L. Britton (1891), ... 25 cents.

No. 23. The American Species of the Genus *Anemone* and the Genera which have been referred to it. By N. L. Britton (1891), . . . 25 cents.

No. 24. Review of the North American Species of the Genus *Xyris*. By Heinrich Ries (1892), ... 25 cents.

No. 25. A Preliminary List of the Species of the Genus *Meibomia* occurring in the United States and British America. By Anna M. Vail (1892), . 25 cents.

No. 26. A List of Species of the Genera *Scirpus* and *Rynchospora* occurring in North America. By N. L. Britton (1892), ... 25 cents.

No. 27. Note on a Collection of Tertiary Fossil Plants from Potosi, Bolivia. By N. L. Britton (1892), ... 25 cents.

No. 28. The Anatomy of the Stem of *Wistaria Sinensis*. By Carlton C. Curtiss (1892), ... 25 cents.

No. 29. New or Noteworthy North American Phanerogams, VI. By N. L. Britton (1892), ... 25 cents.

No. 30. *Ranunculus repens* and its Eastern North American Allies. By N. L. Britton (1892), ... 25 cents.

No. 31. A Preliminary List of American Species of *Polygonum*. By John K. Small. (1892), ... 25 cents.

No. 33. A New Species of *Listera*, with Notes on Other Orchids. By Thos. Morong (1893), ... 25 cents.

No. 34. The North American Species of *Lespedeza*. By N. L. Britton (1893), 25 cents.

No. 35. An Enumeration of the Plants Collected by Dr. Thos. Morong in Paraguay 1888–1890. By Thomas Morong and N. L. Britton, with the assistance of Miss Anna Murray Vail (1892–1893), ... $1.50

No, 36. An Examination of the Seeds of some Native Orchids. By Carlton C. Curtiss (1893), ... 25 cents.

No. 37. Further Notes on American Species of *Polygonum*. By John K. Small (1893), ... 25 cents.

No. 38. New or Noteworthy North American Phanerogams, VII. By N. L. Britton (1893), ... 25 cents.

No. 39. Contributions to American Bryology, III.—Notes on the North American Species of *Orthotrichum*. By Elizabeth G. Britton, . . . 25 cents.

No. 40. New Genera of Plants from Bolivia. By H. H. Rusby (1893), . 25 cents.

No. 41. The Altitudinal Distribution of the Ferns of the Appalachian Mountain System. By John K. Small (1893), ... 25 cents.

No. 42. Notes upon various Species of Iridaceæ and other Orders. By Thomas Morong (1893), ... 25 cents.

No. 43. Notes on the Flora of Southeastern Kentucky. By T. H. Kearney, Jr. (1893), ... 25 cents.

No. 44. Contributions to American Bryology, IV. Notes on the North American Species of *Orthotrichum*—II. By Elizabeth G. Britton (1894), . 25 cents.

No. 45. Studies in the Botany of the Southeastern United States, I. By John K Small (1894), ... 25 cents

No. 46. Plants from Virginia, new to Gray's Manual Range with Notes on other Species. By A. A. Heller (1894), ... 25 cents.

No. 47. New or Noteworthy North American Phanerogams, VIII. By N. L. Britton (1894), ... 25 cents.

No. 48. Contributions to American Bryology, V.—Notes on the North American Species of *Weissia* (*Ulota*). By Elizabeth G. Britton (1894), 25 cents.

No. 49. A Study of the Scale-characters of the Northeastern American Species of *Cuscuta*. By W. D. Matthew (1893), ... 25 cents.

No. 50. A Study of the Genus *Psoralea* in America. By Anna Murray Vail (1894), ... 25 cents.

No. 51. Our Conception of "Species" as modified by the Doctrine of Evolution. By N. L. Britton (1894), ... 25 cents.

The series as above listed will be supplied for $8.

Copies of the Catalogue of Plants found in New Jersey (1889), by N. L. Britton, may be had for **$2.**

Address

DR. THOS. MORONG,

Curator of the Herbarium, Columbia College,

NEW YORK CITY.

F. W. DEVOE & CO.

ESTABLISHED 1852.

OFFICES, CORNER FULTON AND WILLIAM STREETS,

New York.

ARTISTS' · MATERIALS.

Sketching Outfits of All Kinds.
Tube Colors, Water Colors, Crayons, Drawing Paper.
Canvas, Brushes, Oils and Mediums.
Mathematical Instruments,
House Painters' Colors. Fresco Colors.
Fine Varnishes.

CORRESPONDENCE INVITED CATALOGUES OF OUR DIFFERENT DEPARTMENTS TO RESPONSIBLE PARTIES.

COFFIN, DEVOE & CO., 176 RANDOLPH ST., CHICAGO.

Cambridge Botanical Supply Co.

Successors to all Business in Botanical Supplies in

CAMBRIDGE, MASS.,

DEAELRS IN

Herbarium and Laboratory Materials and Apparatus, Microscopes, Books, Specimens, Everything Useful to Botanists.

* SATISFACTION GUARANTEED. *

WILLIAM WALES, Fort Lee, N. J.,

MANUFACTURER OF

FIRST-CLASS MICROSCOPE OBJECTIVES.

MICROSCOPES FURNISHED OF ALL MAKES—ZENTMAYER'S AL WAYS ON HAND. INSTRUMENTS ORDERED IN NEW YORK CITY SENT ON APPROVAL.
DISCOUNT TO COLLEGES.

FOR SALE.

A ZENTMAYER PORTABLE MICROSCOPE,

IN PERFECT ORDER,

For $100.00. - - - Catalogue Price, $147.50

Including THREE OBJECTIVES, 1½ in., ⅓ in., and ⅛ in.
Also an Abbé Condenser, Glass Stage, and Neat Walnut Case.

Address the **Editors of the Bulletin,** or **Wm. Wales, Fort Lee, N. J.**

CHARACEÆ OF AMERICA.

The first fascicle of the Second Part of the Characeæ of America is now ready. It contains descriptions of eight species of *Nitella*, as follows: *Nitella opaca*, Ag.; *obtusa*, Allen; *montana*, Allen; *Blankinshipii*, Allen; *Missouriensis*, Allen; *flexilis*, Ag.; *subglomerata*, A. Br.; *glomerulifera*, A. Br., with fourteen full-page illustrations (eight lithographic plates and six photogravures). These fascicles will be issued from time to time as plates can be prepared; price of each part $1, the actual cost, if the whole edition of 500 copies be sold. Address

T. F. ALLEN,
10 East 36th St., N. Y.

LICHENES BOREALI AMERICANI.

Second edition of Decades of N. Am. Lichens.

PREPARED BY

CLARA E. CUMMINGS, THOS. A. WILLIAMS AND A. B. SEYMOUR.

Numbers 1–80 ready in May. This second edition is prepared in response to urgent requests, the subscription list of the first being full. The second will contain nothing not in the first. The editors are glad to announce that Prof. Thos. A. Williams will hereafter be one of their number. His name will appear with the first edition also after No. 150. **Address**

CLARA E. CUMMINGS,
WELLESLEY COLLEGE, WELLESLEY, MASS.